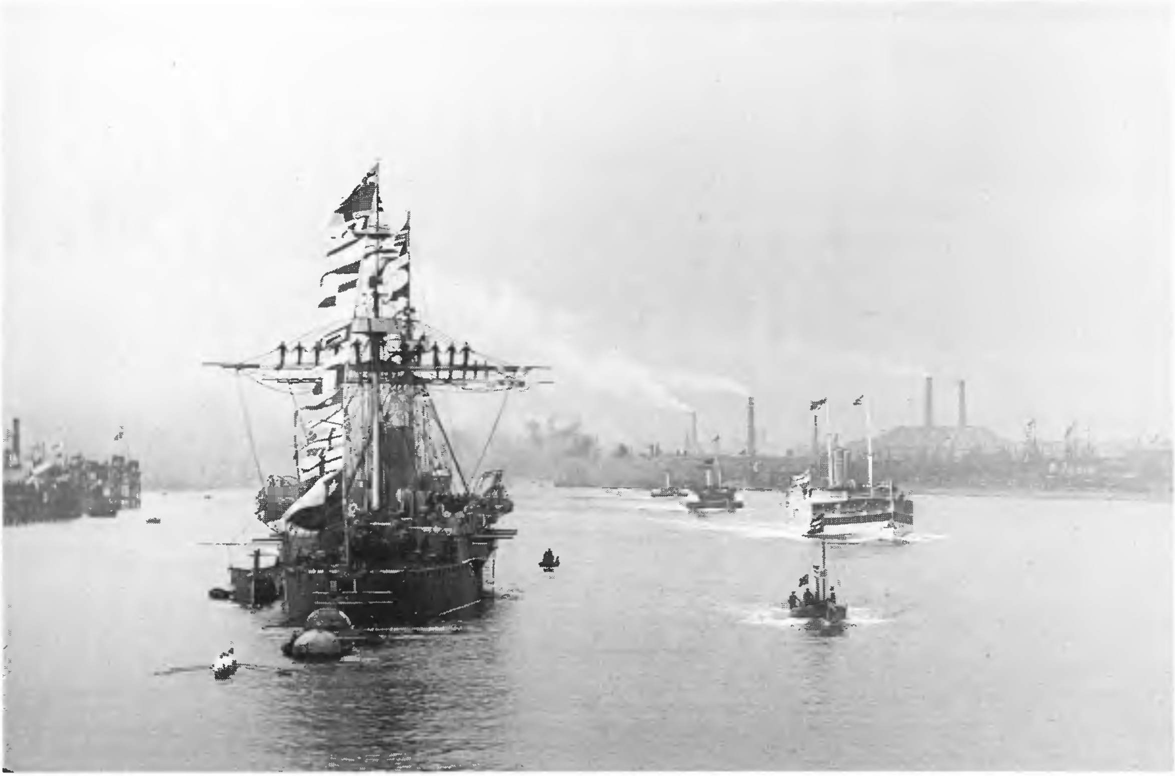
WARSHIPS FOR EXPORT

ARMSTRONG WARSHIPS

1867 - 1927

Peter Brook



ESMERALDA off Elswick, dressed overall and manned for the visit of the Prince and Princess of Wales to Newcastle, 22 August 1884. TRH are embarked in the paddle steamer PARA E AMAZONAS.

Photo : NCL

Front Cover photo shows the river Tyne off Elswick in the spring of 1898, with, from left to right, O'HIGGINS, TAKASAGO and TORDENSKJOLD moored at buoys in the river.

Photo : UNT

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Dimensions unbracketed are in feet and inches. **Length** - between perpendiculars, pp (length overall, oa - and waterline, wl - in round brackets) x **Beam** - extreme x **Draught** - mean.
Metric measurements are given in square brackets.
Displacement is that given for designed draught.
Armament Gun calibres are given in inches for 3in and over, with metric equivalents for foreign-made guns or where foreign navies specified calibres in metric measurements. Below 3in, guns are classed by weight of projectile fired, while smaller guns, machine or anti-aircraft, calibres are given in millimetres.
Complement figures are, as often as recorded, from Armstrong's records.

ABBREVIATIONS

AA	Anti Aircraft	aw	Above water
BCS	Battle Cruiser Squadron	BHP	Brake Horsepower (internal combustion engines)
BL	Breech Loading	BS	Battle Squadron
cal	Length in calibres	cm	Centimetres
CS	Cruiser Squadron	CT	Conning Tower
cwt	Hundredweight (112 lbs)	FD	Forced Draught
ft/sec	Muzzle velocity in feet per second	ft/tons	Muzzle energy in foot tons
HRC	Hotchkiss Revolving Cannon	IHP	Indicated horsepower (reciprocating engines)
lb	Pound	LCS	Light Cruiser Squadron
LWL	Load Water Line	mg	Machine guns
mv	Muzzle velocity	MLR	Muzzle Loading Rifled gun
mm	Millimetre	ND	Normal draught
oa	Overall (length)	oz	Ounce
pdr	Pounder (for smaller guns)	pp	Between perpendiculars (length)
QF	Quick firing gun	RF	Rapid Firing gun (USN for QF)
SHP	Shaft Horsepower (Turbines)	TT	Torpedo Tube
VTE	Vertical Triple Expansion	wl	Waterline
wt	Water-tube (boilers)	w/t	Wireless Telegraphy

PREFACE

My interest in Armstrongs began in 1944 when I bought a copy of the 1903 edition of Janes Fighting Ships. In the Italian section was a photograph of a cruiser, the PIEMONTE, with a description which included the statement that she was one of the earliest Elswick cruisers and that she was the most heavily armed vessel for her size in the world. Intrigued, I found other Elswick cruisers in the volume and comparing them with their Royal Navy equivalents they seemed better gunned, speedier and better looking. Twenty four years later it occurred to me that a description of these ships might be the basis for two or three articles in the recently founded "Warship International".

I wrote to Vickers for more information and eventually I found myself in correspondence with P H Judd, the Chief Naval Architect (merchant ships) who had access to a mass of archival material giving details about Armstrong ships including dates and dimensions together with a number of photograph albums.

Eventually a series of articles were published in "W.I." dealing with Armstrong cruisers and other types. They were mostly bald descriptions with little account of the political climate in which they had been built, nothing about their design history and only a sketchy summary of their careers. Apart from Judd's personal information, based on Armstrong records, all sources were secondary.

A few years ago I was contacted by the late David Topliss, then a mature undergraduate at the University of Cambridge, who was engaged in writing the complex and fascinating story of the RIO DE JANEIRO. From him I learnt that J D Scott, Vickers' historian, had deposited a large amount of Armstrong material in the University Library, most valuably the Elswick Yard Report Books running from 1883 to January 1913, containing bi-monthly reports to the directors on the progress of warships building in the yard.

But why bother to write about a firm which ceased to build warships in 1927, of which possibly only one survives, while not even the shipyards and the works which built and armed them remain?

First, because the firm and its products continue to interest many people, at least judged by the books and articles which continue to be produced. Second, because Armstrongs' history epitomises the rise and fall of a great firm. It was brought to world leadership in the field of ordnance and shipbuilding by the vision and technical gifts of one man, who went on to recruit enormously able colleagues; its decline was caused by poor management, unwise diversification, the slump of the 1920s, competition from Vickers - the firm which eventually took it over - and with many of its former customers becoming self-sufficient in the design and building of warships. Third, the sale of armaments to other countries which began in the Victorian age and continues to this day (vide the Scott equiry) is a fascinating yet often a distasteful story. Fourth, Armstrong products were in the van of technological advance. Fifth, they provided employment to a large number of Newcastle men. Sadly not only the shipyards but the mines and the iron and steel works on which they depended have almost entirely disappeared from the whole of the North East. Finally, Armstrong products played an important part in the history of the late 19th and early 20th centuries. Two examples will demonstrate this. At the Battle of the Yalu in the Sino-Japanese War of 1894-95, Japan's first excursion into imperialism, Armstrong warships fired at, damaged and destroyed each other, while eleven years later at the Battle of Tsushima - one of the decisive naval engagements of the 20th century - it was claimed, not entirely accurately, that all the guns engaged on the Japanese side had been made by Armstrongs*.

Armstrongs own designs are treated in detail, particularly where a full design history exists; ships built to Admiralty designs are included for completeness but are treated more briefly.

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* Admiral Kataoka's 5th Division, the only group with non-Armstrong guns, fired a total of 5 rounds from their Canet 12.6 in guns and 5 from Krupp 12 in, together with 354 rounds of 6 in and 4.7 in from Armstrong quick-firers.

Acknowledgements

It gives me great pleasure to acknowledge the help that I have received over the years in the preparation both of the articles and the book. I owe a great debt to Rear Admiral Roger Morris for his detailed and very constructive criticisms and suggestions, for drawing my attention to inconsistencies and correcting any misuse of naval terminology, and finally acting as editor. I am also indebted to P H Judd of Vickers who went out of his way to give me much material on matters such as launching dates, ships lists and other details. Michael Crowdy of the World Ship Society has meticulously gone over the typscript pointing out inaccuracies and contradictions. Ian Sturton has been responsible for the beautifully detailed line drawings.

I am most grateful to many others. The late David Topliss, then Curator of Ships Plans at the National Maritime Museum, for pointing out the existence of the Vickers archives and for making available the mass of material in his care at the Old Brass Foundry at Woolwich Arsenal, an outstation of the NMM. Andrew Smith of Epping has encouraged me for many years with much detailed information. D K Brown, RCNC, and Dr Ian Buxton of the Department of Marine Technology, University of Newcastle upon Tyne have both been most generous with their advice, especially on technical matters. Others who have been of assistance include Christopher C Wright, Charles Bogart and Joseph Caruana all of Warship International, Dick Keys with his great knowledge of the Elswick Yard, J Allison of Newcastle who gave me information on the early history of Elswick, the late C. de St Hubert and Miss Elizabeth Rowell. I am most grateful to Miss Rosemary Rendel for allowing me access to the papers of Lord Rendel held in the Tyne & Wear Archives.

I must express my gratitude to the Tyne & Wear Archives Service, the Central Library in Newcastle, the Northumberland Record Office, the Admiralty Library and the Manuscript Room in Cambridge University Library, especially Mark Nichols, the National Maritime Museum and the Submarine Museum. From overseas I have received generous help from the Marine Musiet, Horten, Norway and the Ministerie Van Defensie, s'Gravenhage, Holland.

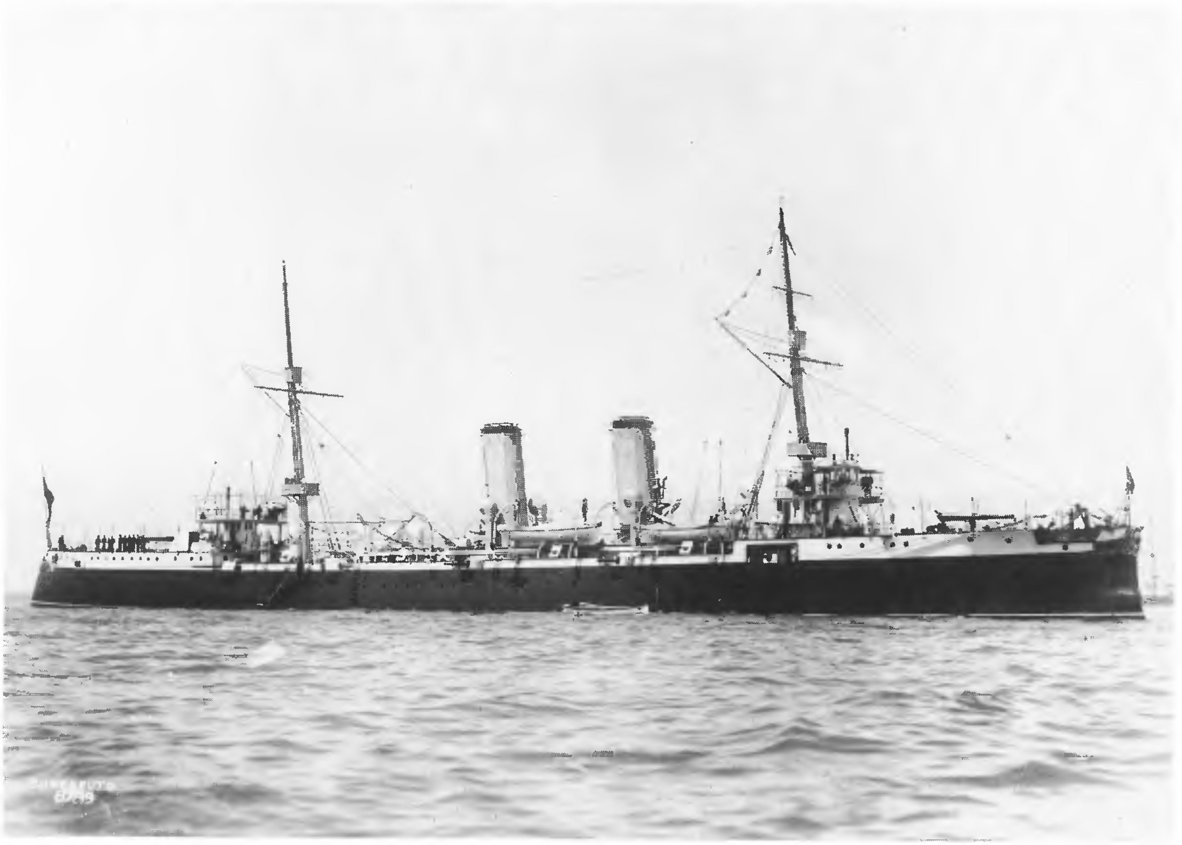
Illustrations

The photographs in this book are from a wide variety of sources, and every effort has been made to trace the original source of the imagery. In a very few cases this has not proved possible, in which case they are attributed to either my own collection or that of Admiral Morris. In the case of the two national collections, those of the Imperial War Museum and the National Maritime Museum, the reference number of the negative within the collection is given. Copies of the photographs are available from the photo sales departments of the museums. The Royal Naval Submarine Museum has allowed the reproduction of the photograph of H 42 from their collection. The Newcastle City Libraries and Information Service, the University of Newcastle, the Vickers Archive of the University of Cambridge, and Vickers' own archives, have all supplied photographs and granted permission for their reproduction. Adrian Vicary of the Maritime Photo Library of Cromer has made a number of interesting pictures available for reproduction. Others have been taken from periodicals of the period, while still others have been generously provided by private individuals who are acknowledged by name against the relevant pictures. I am very grateful to all who have helped me to provide a full pictorial record of Armstrongs' ships. In the interest of space the sources have been abbreviated in the main text.

The bulk of the drawings, all those not credited in the text, have been made by Ian Sturton, to whom I am very grateful. The others have been taken from periodicals of the period, the source being indicated in each case.

ILLUSTRATION CREDIT ABBREVIATIONS

IWM	Imperial War Museum (with ref no)
MPL	Maritime Photo Library (A Vicary)
NAI	Navy & Army Illustrated
NCL	Newcastle City Libraries & Information Service
NMM	National Maritime Museum (with ref no)
R Neth N	Ministerie van Defensie, s'Gravenhage
Trans INA	Transactions of the Institute of Naval Architects
UNT	University of Newcastle upon Tyne
USN	United States Naval Historical Service (with ref no)
Vickers	VSEL archives
Vickers Archive CUL	Vickers Archive in the University of Cambridge Library
WSPL	World Ship Society Photo Library



The Chilean protected cruiser CHACABUCO, a very typical Elswick cruiser of the turn of the century and one of the last to survive, not being finally paid off and scrapped until 1952. Shown here at King Edward VII's Coronation Review at Spithead in June 1902
Photo : IWM Q22231

CHAPTER 1
ARMSTRONGS

ORIGINS

William George Armstrong was a solicitor by training but from a early age had shown interest in mechanical and engineering topics, particularly water power. In 1845 he was involved in providing a new water supply to Newcastle, in the following year he and a group of associates applied hydraulic power to work existing cranes at Newcastle and in 1847 he began to manufacture cranes and hydraulically-worked machines at a - literally - green field site at Elswick, then in open country on the north bank of the Tyne upstream from Newcastle; this, the beginning of the Armstrong empire, was the site of the Elswick engineering and armament works.

Armstrong became interested in guns and gunnery at the time of the Crimean War, designing a breech loading rifled field gun which was lighter and more accurate than existing artillery. Armstrong was appointed Engineer of Rifled Ordnance to the War Department in 1858 and in the next year his partners formed the Elswick Ordnance Company (EOC) in which Armstrong had no financial interest while he remained at the War Office. A major part of the new company's work was producing guns to Armstrong's and the War Office's specifications with the firm being guaranteed a fixed amount of work; by 1863 all work was transferred to Woolwich, the Elswick Ordnance Company receiving compensation for their expenditure on buildings and machinery. Armstrong, who had been knighted in 1859, resigned from his government post in the same year and joined the Company. In 1860 Armstrong persuaded a young Royal Artillery officer, Andrew Noble, to leave the army and join the firm. Noble played a major part in developing the armament side of the business and when Armstrong died in 1900, he succeeded him as chairman although since about 1890 he had been effectively the head of the firm.

Sir Andrew Noble and Lord Armstrong (on the right) some time in the 1890s. Photo : Vickers

In 1864 the engine and ordnance works amalgamated to form Sir W G Armstrong and Co and in the next year blast furnaces were erected at Elswick; in 1883 two 12 ton Siemens open hearth furnaces were opened to produce steel. Chapter 2 describes how in 1868 Armstrong became associated with the shipbuilding business, using Charles Mitchell's Low Walker Yard. Two important decisions were made in 1882. First, Armstrongs and Mitchells amalgamated to form a new company, Sir W G Armstrong, Mitchell & Company Limited and second, that while the new firm would continue to build merchant vessels at Low Walker, a new warship yard would be built next to the existing works at Elswick. The joint value of the two firms was estimated at £1,575,000 and the new company was floated with a capital of £2,000,000. Thereafter Elswick was synonymous with Armstrong warships, especially their fast cruisers, although occasionally warships continued to be built at Walker.

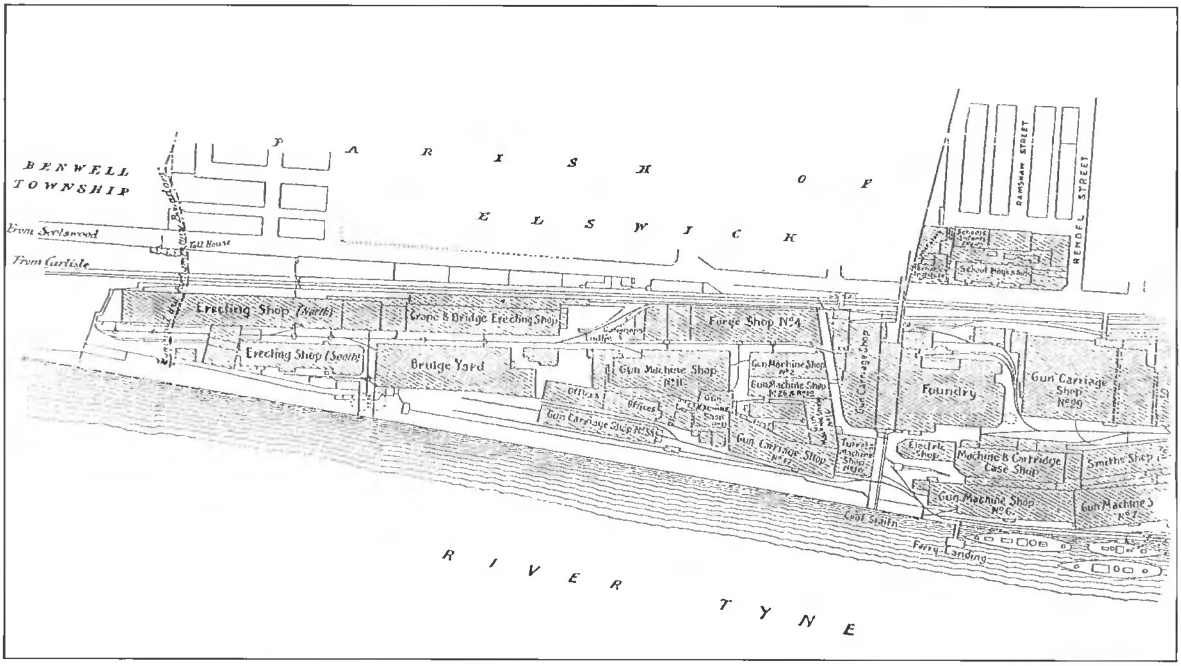
From 1868 until 1879, the firm only produced gunboats but in the latter year the precursor of the protected cruiser type was built, followed three years later by the famous ESMERALDA. The new Elswick yard was inaugurated in 1885 by the launch of the Austro-Hungarian torpedo cruiser PANTHER. In 1887 Armstrong's first battleship, the ill-fated VICTORIA, was launched at Elswick, followed a few years later by a series of three Japanese battleships. High Walker, a new yard replacing Elswick, launched its first warship - MALAYA - in 1915, with the Elswick yard now concentrating on submarines. Armstrongs were successful builders of this type of vessel in contrast to their dismal record in destroyer production, emphasizing the fact that destroyers were best built by specialist yards. It seems fitting that as STAUNCH started Armstrongs on their career as shipbuilders, their last vessel was another gunboat, albeit of a different type, the RATANAKOSINDRA for Siam.

Armstrongs first naval architect, George Rendel, left the firm in 1882 and was replaced by William White early in 1883. The latter returned to the Admiralty in 1885 and was in turn replaced by Phillip Watts. It was during Watts' and subsequently Josiah Perrett's time that Armstrongs became the world's greatest producer of major warships (Table 1/1).

Mitchell died in 1895 and in 1896 the firm was renamed Sir W G Armstrong & Co Limited. It comprised steel works, the Elswick and Low Walker shipyards and the Elswick Ordnance & Engine works. Land had been bought at Pozzuoli in the Bay of Naples in 1885, and the works there, primarily for the construction of guns and mountings, had been completed in 1892. In 1897 Armstrongs acquired the Manchester-based firm of Sir Joseph Whitworth & Co Limited, manufacturers of guns, steel and armour; the resulting company was renamed Sir W G Armstrong, Whitworth & Co Limited. Armstrongs acquired the much smaller Whitworth firm for three reasons; first, to remove a competitor, second to ensure a supply of armour and third to prevent Vickers, which had recently entered the shipbuilding business by acquiring the Naval & Construction Company at Barrow, from taking over Whitworths.

In 1899 land was acquired at Scotswood, two miles upstream from Elswick, for a shot, shell and fuse works, and later, for the manufacture of motor cars. In the next year Armstrong, who had been ennobled in 1887 as Lord Armstrong of Cragside, died and he was succeeded as Chairman by Sir Andrew Noble.

After making profits of £800,000 a year during World War I, the firm began to decline, and eventually the post-war despression resulted in the firm trading at a loss from 1925 onwards (see Table 1/7). There were ill-advised attempts at diversification, notably a venture into paper mills in Newfoundland, which left Armstrongs vulnerable to takeover by Vickers; this, under the guise of an amalgamation of the ordnance and warship building works, took place at the end of 1927. Armstrongs as a manufacturer of ordnance and producer of warships ceased to exist as an entity and became part of a new firm, now trading under the title of Vickers-Armstrong.



Plan of Elswick works, 1903

Sir Andrew Noble

Noble played a major part in the success of EOC as a designer of guns and more importantly with his work on gunpowder; by the late 1870s he had so improved its qualities that an increase in the muzzle velocity of 6in and 8in guns from 1200 feet per second (ft/sec) to 2000 ft/sec was attained without an increase in the pressure in the guns. To utilise the improved powder fully, longer guns were necessary and this forced the Royal Navy to revert, after a lapse of 20 years, to breech loading. Noble, in collaboration with other Armstrong employees such as A J Hadcock and E W Lloyd, developed medium sized quick firers, initially the 4.7in gun in 1886 and a year or so later the 6in. He was enormously hard working and possessed exceptional managerial qualities but was autocratic, and was accused by Stewart Rendel of misusing his powers, particularly to give himself and his two sons excessively large remunerations. He was in effect forced out of active management by a palace revolution in 1911.

Josiah Vavasseur

An essential part of the success of the quick firing gun was the design of the gun carriage (see Appendix 1) and here Vavasseur had a key role. He was a gun maker in London but made his reputation by his gun mountings which used hydraulics to control recoil; his system was adopted by the War Office in 1882 while in 1883 the War Office also adopted his driving ring for projectiles. In that year Armstrongs acquired all of his gun mounting designs and all this work then went up to Elswick with Vavasseur becoming a director and being given charge of the London office, a post which had been left vacant by Stewart Rendel entering Parliament.

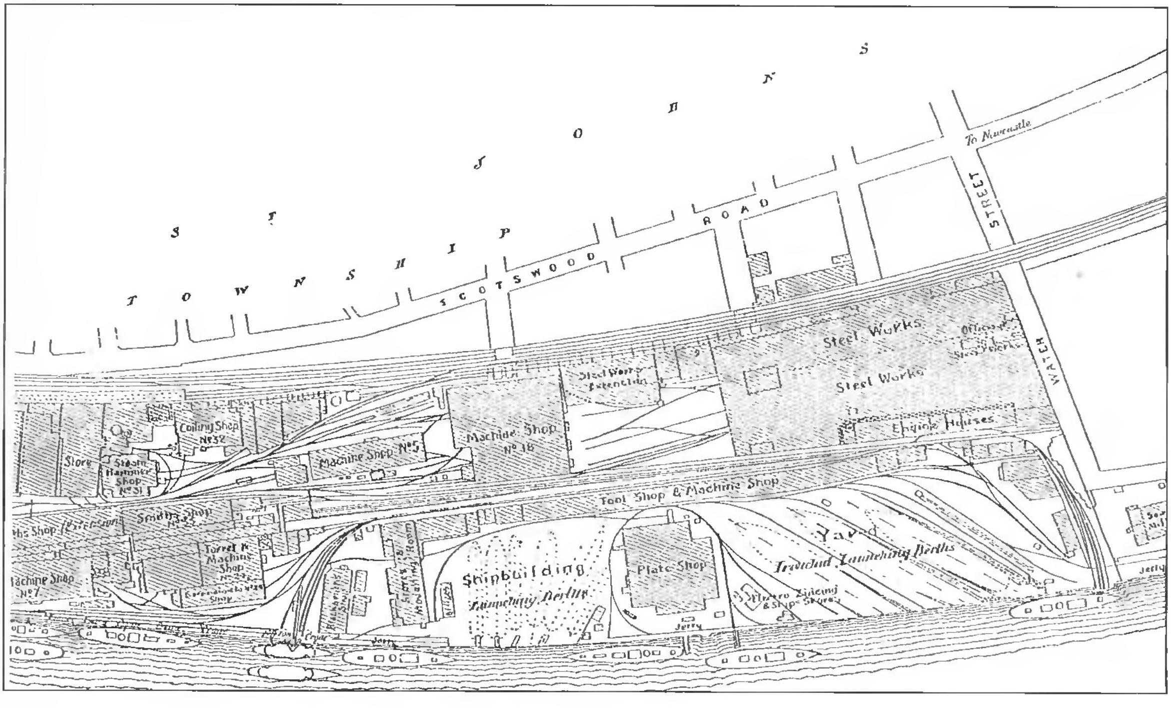
THE YARDS

Low Walker

When Armstrongs needed shipbuilding capacity in 1868 there could be no question of building a ship yard at Elswick. Convenient though the proximity to the rest of the works would have been, the River Tyne at that period was shallow upstream from Newcastle, while immediately opposite the works was an island which reduced the river to two narrow streams.

Charles Mitchell's yard at Low Walker below Newcastle was chosen and between 1868 and 1885, when the Elswick yard became fully operational, 29 warships totalling 25,013 tons were laid down. After 1885 Walker mainly built merchant shipping but eight warships (including three Chinese revenue cruisers) totalling 21,772 tons were built there, mostly in the late 1890s

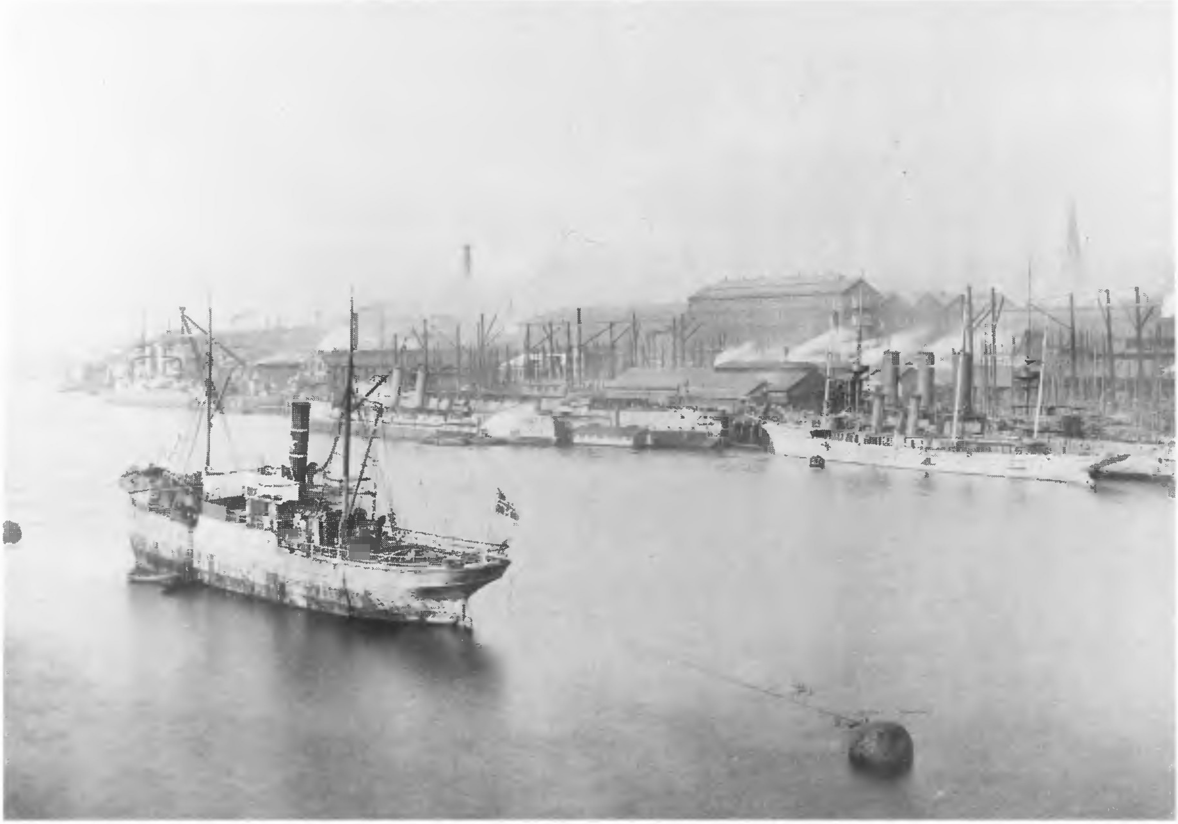
Armstrongs built many more merchant ships than Vickers, producing more than 300 in the period 1883-1928, totalling something in excess of 1¾million GRT. Vickers, on the other hand, was in its early days primarily a builder of warships, with 77% to 93% of its output from 1903 to 1910 being of this type. Armstrongs pioneered the modern oil tanker, building 181 vessels of this type and were particularly proud of the icebreakers that they built for Russia.



The Low Walker yard, which was not included in the Vickers takeover, was closed in 1931, reopening during World War Two when it was managed by The Shipbuilding Corporation Limited (Tyne Branch).

Elswick

By 1883 the building of a shipyard at Elswick became practicable following the dredging of the Tyne, the removal of the island opposite the works and the erection of the swing bridge (built at Elswick) over the Tyne between Newcastle and Gateshead. All of these changes made it possible for large vessels to go up river from Newcastle and gave sufficient room and depth in the river to allow for launches to take place. Work began on the new yard in April 1883 and the first warship, the Austrian PANTHER, was completed in June 1885; work on the shipyard was delayed by the necessity for piling the marshy soil. Eventually the slips at Elswick were too small, particularly in length, for the increasingly large battleships being built, and whose beam and height made it impossible for them to go through the Tyne bridges. The last major surface warship to be built at Elswick was EAGLE.



Elswick Yard, May 1904. On the right the Ottoman Sultan's yacht ERTOGRUL lies outboard of the cruiser ABDUL HAMID. In the centre HMS AMETHYST, with only two of her three funnels erected, is outside the armoured cruiser HAMPSHIRE, while to the left SWIFTSURE is fitting out for RN service.

Photo: Vickers archive CUL

High Walker Naval Yard

For the reasons given above it became imperative to build a new yard and in July 1910 the decision was made to acquire a new site on the Tyne below Newcastle at Walker. It was initially named the Armstrong Yard but often referred to as High Walker and later was also known as the Walker Naval Yard. It was inaugurated in October 1913 by the laying down of the QUEEN ELIZABETH class battleship MALAYA. Although the Armstrong directors ordered that work at the Elswick yard was to cease in April 1914 and that the High Walker yard was to be utilised as soon as possible, ten submarines were laid down at Elswick between 1913 and 1915. Between 1914 and 1922, NELSON, the large light cruisers COURAGEOUS and FURIOUS, the aircraft carrier HERMES, seven light cruisers (one cancelled), eight sloops and fourteen submarines were laid down at High Walker. Two submarines were not completed and one was towed away to complete at an Admiralty dockyard, as were the aircraft carrier HERMES and the light cruiser EMERALD. ANSON, a near sister ship to HOOD, was scrapped on the stocks before launching. Between 1913 and 1922, 188,100 tons of warships were laid down at High Walker.

High Walker was closed down at the end of 1927, temporarily reopened to build a liner, the MONARCH OF BERMUDA, and then closed again in 1931. During the period of rearmament in the mid 1930s it was opened again in 1933 by Vickers Armstrong, with the hull of the destroyer FIREDRAKE being laid down in July 1933.

Before and during the Second World War the yard was at full stretch building a total of one battleship, three aircraft carriers, an aircraft maintenance ship, four cruisers, twenty five fleet and eight Hunt class destroyers, a monitor and sixteen submarines. After the war the inevitable run down culminated in the yard being sold to the Swan Hunter Group in 1968. After 1980 it was only used for fitting out ships launched at Wallsend and in April 1985 British Shipbuilders closed it, the site being sold and redeveloped as an offshore technology park while Elswick is now a business park.

THE NAVAL ARCHITECTS

Armstrongs were fortunate in having in succession five highly gifted naval architects; probably no other firm, including Vickers, could match the design skills of George Rendel, William White, Phillip Watts, and Josiah Perrett. As well as being first class naval designers, all had to be salesmen, making frequent journeys to foreign countries. To these names should be added one other, Eustace Tennyson D'Eyncourt, a gifted designer and a salesman extraordinary.

George Wightwick Rendel

George was the eldest of three brothers associated with the firm. Hamilton, a brilliant engineer, spent his whole working life with Armstrongs in the engine works while the youngest, Stewart, made his reputation as an arms salesman and was connected with the firm until his death in 1913, being then Vice Chairman. However, from 1880 he was an MP and gave up his job as London manager; subsequently he was ennobled with the title of Baron Rendel of Hatchlands. In later years he became a bitter critic of the Noble family, Sir Andrew and his two sons John and Saxton.

George Rendel. Photo: Trans INA

George Rendel received his training as an engineer in the office of his father James, joining Armstrongs in 1858 and being put in charge of the ordnance works developing mountings; at the time of the building of the STAUNCH (see Chapter 2) he became increasingly involved in ship design and two classes of ship designed by him, represented by TSUKUSHI and ESMERALDA, were revolutionary in their design and were in effect the first modern cruisers. He resigned from the firm in 1882 to become an extra Civil Lord of the Admiralty. On a change of government he left the Admiralty and having married an Italian wife he went to live in Italy. He rejoined the firm when Armstrons opened the Pozzuoli works in the bay of Naples where he was put in charge and remained an Armstrong director until his death in 1902. As a matter of policy, Pozzuoli never had a shipyard although CASTORE and POLLUCE were re-assembled and launched there while Rendel designed no more ships.

William Henry White

White was an apprentice at Devonport Dockyard, was sent by the Admiralty to the Royal School of Naval Architecture at South Kensington and then was appointed to the Admiralty constructive staff. By 1883 he had been closely involved with the design of the all-steel despatch vessels IRIS and MERCURY, and then the MERSEY class, the first modern cruisers in the Royal Navy. He was seen as the natural successor to Nathaniel Barnaby, the Director of Naval Construction, but joined Armstrongs as their chief naval architect and manager of the Elswick Yard, doubtless much influenced by a very generous salary and commission. The ships he designed are listed in subsequent chapters but he was also responsible for the building and development of the Elswick Yard. In1885 he was asked to return to the Admiralty as DNC and accepted,despite a drop in income; for the next 17 years he was responsible for the design of the late

Sir William White in court dress and the insignia of a KCB. Photo : NAI

Victorian fleet of pre-dreadnoughts, large protected cruisers and the Royal Navy's first armoured cruisers.

Phillip Watts

Watts, like White, was a product of the Admiralty constructive department, where he was employed from 1860 to 1885, then joining Armstrongs. An important part of his experience was the two years that he spent working at the Admiralty experimental tank at Torquay under William Froude. His reputation was such that when White retired as DNC at the end of 1902 Watts took his place at the Admiralty, remaining there until 1912 during which time he became responsible for the design of DREADNOUGHT and her successors, with his work culminating in the superb fast battleships of the QUEEN ELIZABETH class. Practically every capital ship of the Grand Fleet in World War One was one of Watts' creations. After leaving the Admiralty he joined the Armstrongs board in 1916, remaining there until of his death 10 years later. Like White and Tennyson D'Eyncourt he received a knighthood but before this he was often referred to, for example in the Transactions of the Institution of Naval Architects, as Colonel Watts because of his being Lieutenant Colonel in the Royal Garrison Artillery Volunteers.

Josiah Perrett

Perrett was also a product of the Admiralty system, receiving his formal training at the Royal School of Naval Architecture at South Kensington. From 1871 to 1883 he was assistant to the Froudes, William and then his son, Edmund, at the Admiralty experimental tank at Torquay, experience which was of enormous value in getting off the best lines for his designs. In 1886 he became Phillip Watts' principal assistant at Armstrongs, succeeding him as chief naval architect when Watts moved back to the Admiralty in

Phillip Watts as Chief Naval Architect of Armstrongs,

Photo : NAI

Josiah Perrett Photo : Trans INA

1903. Perrett was offered the post of DNC when Watts retired but as he was then 64 he refused; it seems likely that he may have played some part in the appointment of Eustace Tennyson D'Eyncourt. He retired in 1916. His reputation has been overshadowed by Watts, but study of the designs prepared by him show that he was a daring and successful innovator. He was responsible for AMETHYST, the first warship larger than a destroyer to have turbine machinery, ATTENTIVE and BAHIA, each for a time the fastest cruiser in the world, MINAS GERAES, the first dreadnought to have a ten gun broadside and the "Big Battleship" RIO DE JANEIRO, later AGINCOURT, the only 14-gun dreadnought.

During his 14 years with Armstrongs the aggregate displacement of warships built there was in the order of 165,000 tons with a total IHP of 272,000. During his time the firm began the construction of submarines. In his last three years with Armstrongs the naval yard at High Walker came into operation.

Eustace Tennyson D'Eyncourt

D'Eyncourt was a premium apprentice at Armstrongs for five years, from 1886 to 1891, during this time acquiring a theoretical background by attending the naval architecture course at the Royal Naval College at Greenwich. He was on the permanent staff at Elswick after completing his training but because he wanted experience in merchant ship building he joined Fairfields in 1898 as chief naval architect, rejoining Armstrongs in 1903 to take charge of the design office where he remained until becoming DNC in 1913. After retiring as DNC in 1924 he rejoined Armstrongs as a director from 1924 to 1928 and then joined the board of the Parsons Marine Steam Turbine Co. He was a gifted naval architect, developing the early aircraft carriers, introducting bulge protection for warships and was also involved in the early development of the tank. He had unusual diplomatic skills as shown in the negotiations with Brazil in 1911 which finally led to the RIO DE JANEIRO design.

ARMSTRONGS AND THE GROWTH OF THE ARMAMENT TRADE

Before the advent of the steam engine and the iron hull, warships could be built by any country; the changes which came about in the first 60 years of the 19th century meant that warships could only be constructed, engined and armed by countries well advanced technologically. In practice this meant initially only Britain, France and the United States of America. Other countries soon to become major naval powers, such as Prussia, Japan, Russia and Italy, were dependent on more industrially advanced countries for ironclads until the mid 1860s to the 1870s, by which time their ship building capacity began to be developed. In Japan, and to a limited extent Russia, this dependence lasted until the beginning of the twentieth century. Other countries such as Turkey, China and the South American republics never developed a flourishing indigenous warship building industry.

French, British and US firms supplied the demand for warships for other countries but very quickly Britain came to dominate the market as it did for merchant ships and amongst British ship builders it was Armstrongs who were the leaders for nearly 40 years; Table 1/1 shows the wide range of countries to whom the firm supplied warships and their armament. No other British ship builders came near to Armstrongs as a rival until in 1897 the steel firm of Vickers acquired a shipyard at Barrow and in less than 10 years had begun to outstrip Armstrong, as Table 1/2 demonstrates. Vickers were aided by a far superior management structure, aggressive selling, an arrangement for division of work and profits with Armstrongs – usually much to Vickers advantage – and from 1901 the lucrative submarine contracts for the Royal Navy where Vickers had, until 1913, a commercial monopoly on all submarines built under contract in the country. Armstrongs had for many years been the leaders in cruiser design and construction but now Vickers had established their reputation, which continues to this day, as the country's submarine specialist (Tables 1/2 and 1/3). Despite their later start, Vickers had by 1928 produced more warships than Armstrongs, but because so many were submarines of small displacement Armstrongs total tonnage was half as great again.

MACHINERY

Armstrongs did not produce their own engines apart from diesels for four, possibly six submarines, until after World War I, but until this time relied on other firms. An important local manufacturer with its works first at Forth Banks, and later at St Peters, on the Tyne was R & W Hawthorn – after 1886 R & W Hawthorn, Leslie and Co; another major supplier was the Wallsend Slipway and Engineering Company who began supplying engines later than Hawthorn Leslie and came close to equalling them in terms of horsepower although Hawthorn Leslie engined more Armstrong-built ships than any other supplier. Another important source of machinery was the London-based firm of Humphrys Tennant & Company but they ceased supplying after 1906. In 1894 Charles Parsons began to develop turbine machinery for marine propulsion and shortly after, Vickers started to supply an increasing number of engines. The names of all known manufacturers of machinery for Armstrong warships are given in Table 1/4, with the total horsepower and the number of ships for which engines were provided.

ARMSTRONGS AND THE BRITISH SHIPBUILDING INDUSTRY

Table 1/5 demonstrates that Armstrongs was, until the rise of Vickers in the early twentieth century, the largest builder of warships in the country; in addition the firm built massive tonnage for foreign countries, more than all other British shipyards combined. The main torpedo vessel builders, Yarrow, Thornycroft and J Samuel White, built large numbers of craft with many destined for overseas navies, but because of the small size of torpedo craft, particularly in the late nineteenth and early twentieth centuries, their total tonnage was relatively small.

Armstrongs had a further advantage in that, until the advent of Vickers, it was able to supply guns, and after the merger with Whitworths, armour. An important weakness was that the firm did not build engines until after the First World War. Vickers' strength was that the firm was completely vertically integrated, producing hulls, armour, machinery and armament with no dependence on outside firms. The Clydeside firms had no armaments company there until Beardmores opened a gun factory, which, however, did not manufacture heavy mountings, in Glasgow in 1908, but by that time Vickers by acquiring half the shares had reduced the firm to almost satellite status. It was not until 1905 that Fairfield and John Brown, in conjunction with the Birkenhead firm of Cammell Laird, formed the Coventry Ordnance Works which was equipped to make the largest guns and gun mountings, a project which came to fruition in 1908. This enabled them to challenge Armstrongs and Vickers.

ARMSTRONGS AND THE ROYAL NAVY

What effect did Armstrongs have on Admiralty designed warships?

There can be little doubt that ESMERALDA influenced the design of the MERSEY class; one recent historian states that in April and May 1882 W H White, still at the Admiralty, was working on the MERSEY design with the plans for the early Elswick cruisers beside him. The small MEDEA class cruisers were based on the DOGALI, which was under construction when W H White left Elswick to join the Admiralty as DNC. What is less certain is Armstrong's influence on British armoured cruiser designs. Both ESMERALDA and O'HIGGINS had narrow belts but ASAMA with armour covering waterline and the side of the lower deck, was laid down two years before the first of the modern RN armoured cruisers. It is more likely that the major factor in the emergence of the type in the RN was improved armour technology rather than Elswick's example.

In the 80s and 90s Armstrongs supplied the Royal Navy with large numbers of guns, together with mountings, most especially medium calibre quick firers but including the 110 ton guns mounted in VICTORIA, SANSPAREIL and BENBOW. Table 1/6 lists the numbers and types of warships, which, although not built by the firm were armed, partly or wholly, by Armstrongs and includes foreign navies as well as the Royal Navy.

TABLE 1/1

ARMSTRONG WARSHIP PRODUCTION 1867-1927

COUNTRY	Number of Ships	Displacement Tonnage
Siam	1	1,070
Romania	1	1,331
Turkey	1	3,805
Portugal	1	4,253
Netherlands	2	340
Spain	2	2,108
Austria-Hungary	2	3,082
Yugoslavia	2	1,960
U.S.A.	2	6,874
Norway	4	14,554
Australian Colonies	5	2,764
Italy	5	8,969
Argentina	5	13,629
Brazil	6	30,906
Chile	9	61,670
Japan	13	100,587
China	21	24,415
Royal Navy	77	386,077
TOTAL	**159**	**668,394**

Notes Figures do not include two TGBs, bought from outside and subsequently sold to Brazil and China, yachts, icebreakers, transports, Russian Volunteer Fleet ships, or five Russian warships built by Charles Mitchell & Co 1864 - 1866. Submarine displacements are in surface condition. RN totals include four submarines transferred to Italy in 1916 and HM Ships SWIFTSURE (ex Chilean), AGINCOURT (ex Turkish, ex Brazilian), EAGLE (ex Chilean) and GLATTON and GORGON (ex Norwegian)

Sources Perrett: Particulars Book: Armstrong records (Judd)

TABLE 1/2

VICKERS WARSHIPS PRODUCTION 1896 - 1927

Country	Number of Ships	Displacement Tonnage
China	1	2,460
Mexico	1	1,850
Russia	1	15,200
Brazil	1	19,250
Peru	2	6,400
Japan	5 (2 submarines)	59,278
Royal Navy	27 surface ships	250,540
	144 submarines	98,248
TOTAL	**182**	**453,226**

Note Includes 2 RN submarines towed away for completion. Does not include converted merchant ships. In the same period Armstrongs laid down and completed eighty five warships of 510,304 tons.

Source "Vessels etc built at the Naval Construction Works, Barrow in Furness". C.U.L. Vickers archive 1104.

TABLE 1/3
TOTAL NUMBERS & TONNAGE BY TYPE OF VESSEL PRODUCED BY ARMSTRONG & VICKERS UP TO 1928

Type of Vessel	Armstrongs	Vickers
Battleships	15: 297,109	11: 221,950
Aircraft carriers	2: 33,127	
Coast Defence Ships	6: 24,204	
Cruisers - all types	58: 251,320	18: 123,383
Torpedo Vessels – all types	12: 9,073	2: 1,107
Gunboats/Monitors	29: 14,479	3: 3,600
Sloops	8: 10,342	2: 4,310
Miscellaneous	8: 9,856	
Submarines	21: 15,884	146: 98,876
TOTAL	**159:665,394**	**182: 453,226**

Note Does not include merchant ships converted to naval vessels.
Sources Judd and Particulars Book for Armstrong: C.U.L. Vickers archive 1104 for Vickers.

TABLE 1/4
MACHINERY BUILDERS FOR ARMSTRONG WARSHIPS

Name & Location of Firm & Period when Supplying to Armstrongs			Total HP (Brake, Shaft or Indicated)	No of Ships
R S Stephenson	Newcastle	1867	150	1
Ross & Duncan	..	1882	315	1
North British Diesel	..	1917	240	1
Ravenhill Hodgson	..	1871	300	2
Jackson & Watkins	..	1871-1872	220	2
Thompson & Co	..	1876	1,010	4
North Eastern Marine Eng Co	..	1886	1,290	1
Ernest Scott (Scott & Mountain?)	..	1888	2,000	1
Ruston & Hornsby	Lincoln	1917-1918	2,160	5
Schneider	France	1914-1916	2,940	4
J Penn & Sons	London	1896	7,000	1
Armstrong Whitworth	Newcastle	1918-1927	14,400	6
G E Belliss	Birmingham	1888-1890	20,000	5
Maudslay Son & Field	London	1888-1890	27,000	4
John Brown & Co	Clydebank	1913	92,000	2
Vickers	Barrow	1907-1926	155,300	8
Parsons Marine Steam Turbine Co	Newcastle	1900-1918	253,750	5 (& low power turbines for LATORRE and COCHRANE)
Humphrys Tennant & Co	London	1885-1906	344,350	24
R & W Hawthorn (later Hawthorn Leslie)	Newcastle	1879-1917	405,330	55
Wallsend Slipway & Engineering Co	..	1887-1927	466,350	25

Note. Machinery Builders for G&E class submarines not known. Figures are, as far as possible,given as the highest designed horsepower.
Sources. Particulars Book; Perrett; Conway 2; Ships Particulars Book for submarines & sloops.

TABLE 1/5
WARSHIP OUTPUT OF MAJOR BRITISH SHIPYARDS 1868 - 1927

Firm	Total Tonnage	Tonnage for Overseas	Overseas as % of Total
Armstrongs	665,394	279,317	42.0
Vickers	453,226	83,338	18.4
Thomson/Clydebank/ John Brown	382,321	27,456	7.2
Elder/Fairfield	343,714	—	—
Palmer	250,896	500	0.2
Beardmore	211,734	—	—
Cammell-Laird	184,973	27,570	19.9
Harland & Wolff	107,607	—	—
Scotts	98,230	—	—
Hawthorn Leslie	63,556	(Not including Turkish ordered in 1914)	
Earles	59,693	11,600	19.7
Napier	49,542	5,033	10.2

Notes Specialist torpedo vessel constructors, Yarrow, Thornycroft & White not included.

Sources Peebles H. "Warship building on the Clyde"; Armstrong archives; Vickers archives; Davidson J. "From Collier to Battleship"; Hume & Moss. "The history of a Scottish industrial giant"; Hollett D. "Men of Iron"; Moss M. "Shipbuilders to the World"; Anon "250 years of ship building by Scotts of Greenock"; Clark J. "Power on land and Sea"; Credland A. "Earles of Hull"; Conway 1, 2 and 3.

SULTAN OSMAN I fitting out at Low Walker, 1914

Photo : The Engineer 1914

TABLE 1/6

OTHER WARSHIPS ARMED OR RE-ARMED BY ARMSTRONGS AND ARMSTRONGS POZZUOLI TO 1906

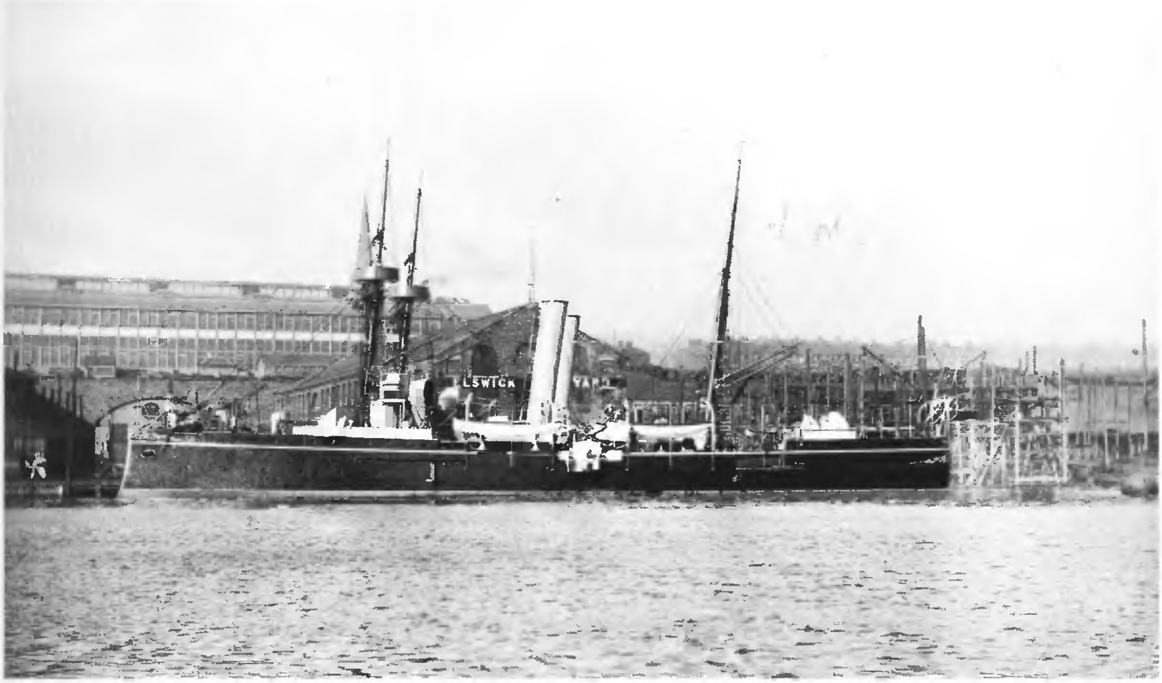
Royal Navy	Battleships	54
	Armoured Cruisers	12
	Cruisers	9
	Gunboats	2
Royal Italian Navy	Battleships	17
	Armoured Cruisers	6
	Cruisers	16
	Despatch vessels	2
	Depot Ships	1
Imperial Japanese Navy	Battleships	4
	Armoured Cruisers	5
	Cruisers	4
	Destroyers	10
Argentine Navy	Armoured Cruisers	2
	Coast Defence Ships	2
	Cruisers	2
	Torpedo Gunboats	3
	Gunboat	1
Brazilian Navy	Battleships	2
	Coast Defence Ships	2
	Cruisers	2
	Torpedo Gunboats	3
	Gunboats	1
Chilean Navy	Battleships	1
	Monitors	1
	Cruisers	1
	Torpedo Gunboats	1
	Destroyers	4
	Torpedo Boats	2
Royal Portuguese Navy	Coast Defence Battleship	1
Royal Spanish Navy	Armoured Cruiser	1

Source Warships and War Material. Vickers Archive 2000. C.U.L.

TABLE 1/7
THE FINANCIAL RECORD
Profits after Taxation 1883-1928

Year	Profit £	Year	Profit (Loss) £
1883	146,120	1906	652,639
1884	150,246	1907	722,409
1885	172,367	1908	491,350
1886	195,415	1909	500,325
1887	213,973	1910	611,345
1888	233,594	1911	681,138
1889	243,924	1912	761,765
1890	314,588	1913	877,684
1891	309,621	1914	925,522
1892	228,784	1915	4,053,605
1893	231,181	1916	
1894	263,246	1917	
1895	251,516	1918	
1896	335,157	1919	
1897	442,868	1920	675,179
1898	490,962	1921	438,887
1899	653,612	1922	467,549
1900	671,106	1923	436,376
1901	564,864	1924	505,250
1902	652,698	1925	(891,503)
1903	631,359	1926	(531,210)
1904	618,414	1927	(527,953)
1905	652,639	1928	(551,970)

Source : Warren.



Spanish small cruiser ISLA DE CUBA alongside Elswick yard with her sister ISLA DE LUZON inboard in the summer of 1887, before delivery. Photo : NMM P39804

CHAPTER 2
GUNBOATS

INTRODUCTION

In the latter half of the nineteenth century the Royal Navy built a wide range of vessels under the generic title of Gunboats. Most originated from those developed during the Crimean War of 1854-55. Initially they were small, displacing 300-500 tons, wooden hulled, had a light sailing rig, were propelled by a single screw and carried 2 x 68 pdr muzzle loading guns. Over the next forty years they became progressively larger ultimately displacing 1280 tons and had a heavier rig, barque or barquentine. Composite construction replaced wood and the last types were built of steel. All of these ships carried a relatively light armament, had good seakeeping properties and long ranges. They were much used for overseas "police" duties, in minor wars, on punitive expeditions and for surveying.

In total contrast, and quite different in function, were the iron or steel built "flatirons" or 'Rendel' gunboats built in the late 1860s and early 1870s. They were short and beamy with a low length-beam ratio, typically 3.3/1 compared with the first types' ratio of 5 - 6.5/1. They carried a light rig or none, were of shallow draught, had twin screws to give manoeuvrability and carried one heavy gun firing over the bows. Initially the gun would be a 9 in or a 10 in MLR worked by hydraulic mechanism and capable of only very limited traverse. They were built solely for harbour defence but were capable of making long sea passages, for example to China or Australia. The type was quickly copied by other navies – initially by ordering from Armstrongs – including the Australian colonies, Holland, China, Denmark, Argentina, Norway, Russia and Sweden. Armstrongs were the type's progenitors and their genesis was an unusual one.

When Armstrongs went into the business of gunmaking, the guns had to undergo proofing. A number of sites were used, including the marshy foreshore of the Tyne at Dunston opposite Elswick Works, Jesmond Dene just north of Newcastle and at Whitley Bay. However local inhabitants objected to the gunfire, so that the resulting restrictions made it increasingly difficult to use these places and alternatives had to be found. One was to mount the gun to be tested on a barge which was then towed out to sea for the proof trials. This method was first used on 21 October 1865; later a land site at Ridsdale was developed. The success of his floating mountings gave George Rendel the idea of building a small, self propelled barge-like vessel, mounting a large gun firing over the bows, which could be used as a mobile floating battery. The first such vessel was HMS STAUNCH.

Also involved in the genesis of STAUNCH was Captain (later Admiral Sir) Cooper Key, Captain of HMS EXCELLENT, the Royal Navy's gunnery school. Key was friendly with Rendel and it is possible that it was Key who first produced the gunboat concept. What is certain is that in March 1867 Key sent the Admiralty the plans for the gunboat designed by Rendel and recommended the adoption of the type.

In 1881 Sir William Armstrong in his Presidential address to the Institution of Civil Engineers summarised the virtues of the Rendel gunboat. Floating defences were preferable to fixed ones; gunboats could carry heavy guns but being of small displacement they would only offer a small target; several could operate together, sufficiently spread out so as not to interfere with each other's fire but able to bring converging fire on a single target. Their twin screws gave them a small turning circle so that it was simple to train the guns by turning the whole boat, while their shallow draft meant that they could retreat to shoal water or fire behind sandbanks or breakwaters in order to gain additional protection.

Armstrong stressed the value of their mobility, enabling defences to be concentrated where most needed. He saw a combination of gunboats and torpedo launches, all manned by trained local volunteers, as providing the most effective defence for harbours and one which would free the Fleet from defence duties in order to carry out offensive operations. Sir Spencer Robinson, late Controller to the RN, was another enthusiast, eulogising them in his evidence to the Committee of Design (pp 53-54) as "the most valuable class of boat we have, and I wish we had 100 of them" and seeing them as valuable in attacking ports, although needing to be under convoy of vessels with big guns.

In practice the Rendel gunboats provided an unsteady platform for their big guns. Captain R A E Scott poured cold water on the practicability of pointing the gun by training the whole ship, stating that from his own experience the smallest lurch, roll or swing disturbed the aim even if the big gun were capable of as much as a 25° traverse on each side of the centre line.

The development of quick-firing guns in the early 80s meant that gunboats could easily be dealt with by small boats of even shallower draft armed with quick-firing guns and spar torpedoes.

Tactical considerations aside, what Key and many of his contemporaries quite failed to understand was that, in his biographer's words, "before such vessels could be called into action there would have been Imperial collapse and possibly, if not probably, nothing to defend". This must have become clear to the Admiralty as after STAUNCH, a near sister PLUCKY built by Portsmouth Dockyard, and twenty four larger vessels (twenty ANT class and four GADFLY) ordered in 1870-72, no more of the type were built for the Royal Navy.

Armstrong's produced three Rendels for the Royal Navy, two for Holland, eleven for China, five for Australian colonies including a larger cruiser/gunboat hybrid, PROTECTOR, and two for the Italian Ministry of War. In addition Armstrongs built two of the type for testing their own guns and mountings, both subsequently sold to the Royal Navy. Also two composite-hulled gunboats of the colonial type were built for the Royal Navy. Much later two river gunboats were built for Argentina and one for Siam.

STAUNCH's lasting contribution to Armstrongs was that she launched the firm into shipbuilding. Having no yard of their own it was arranged that Armstrong-designed warships would be built by Charles Mitchell at Low Walker, with Armstrongs supervising the building of their own ships. This arrangement continued until the amalgamation of 1882.

TABLE 2/ 1
WEIGHTS, IN TONS (AND PERCENTAGES OF NORMAL DISPLACEMENT) IN GUNBOATS AND GUN VESSELS

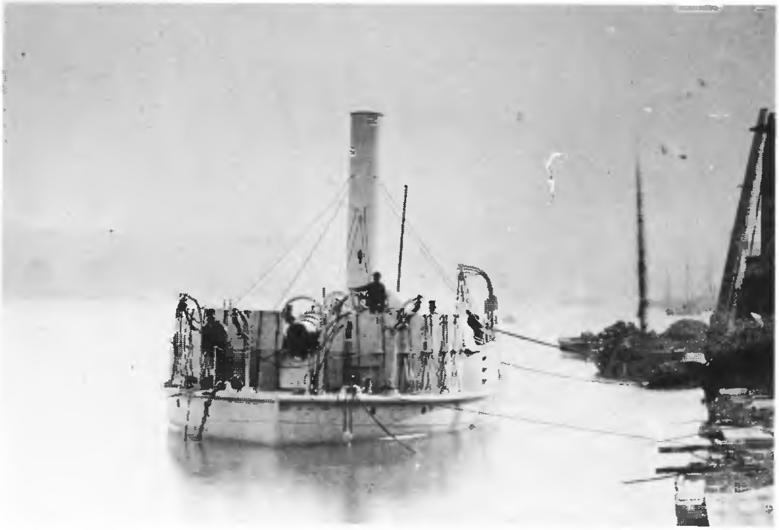
Name	HANDY	ALBERT	VICTORIA	PROTECTOR	PALUMA
Hull and Fittings	51 (23.39)	134 (39.88)	253 (47.11)	442.5 (46.88)	210.25 (51.03)
Equipment	–	38 (11.31)	44 (8.19)	74.5 (7.89)	38 (9.22)
Armament	89 (40.83)	54 (16.07)	57 (10.61)	107 (11.33)	53.75 (13.05)
Machinery	68 (31.19)	60 (17.86)	113 (21.04)	170 (18.01)	60 (14.56)
Coal	10 (4.59)	50 (14.89)	70 (13.04)	150 (15.89)	50 (12.14)
TOTAL	218	336	537	944	412

Source : Thurston green notebooks, NMM

STAUNCH
Great Britain

Yard & No	Laid down	Launched	Final trials	Designer
Low Walker 160	17 June 1867	4 Dec 1867	4 Dec 1867	G Rendel

Displacement	180 tons.
Dimensions	80 x 25 x 6ft 5in [24.38 x 7.6 x 1.97]
Armament	1 x 9 in 12½ ton MLR gun.
Machinery	2 sets simple engines by R Stephenson. Designed IHP 150 = 7 knots.
Fuel	Coal. 15 tons.
Complement	25



STAUNCH as completed, 1867, with the bulwark plates raised.

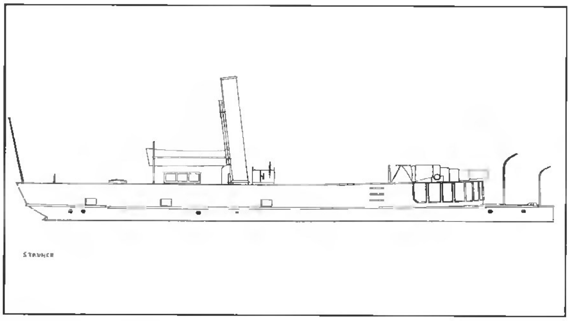
Photo : Vickers

General

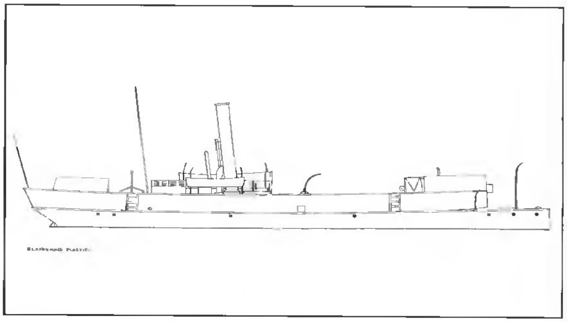
STAUNCH, like most of the early Rendels, was built of iron. Her gun was mounted on a slide, being run in and out by tackle powered by two small steam capstan heads; they could also be used to traverse the gun by a few degrees. This mechanical arrangement meant that six men could work the gun instead of the more usual sixteen. Shells were raised from the shell room by the same means. Aiming was designed to be effected by training the whole boat, hence the presence of twin screws. Some protection was given to the gun and its crew by hinged iron bulwarks. The gun and slide were carried on a platform, weighing in total 22 tons while the whole could be lowered or raised by four hydraulically powered screws, one at each corner of the platform. Raising or lowering took about six to eight minutes with the gun down while when the gun was down the bulwarks could be lowered inboard to cover over the opening; this feature was not repeated in later Rendels. Because of her short length and her twin screws she was very manoeuvrable. On trials with both engines going ahead she turned a complete circle in 75 yards, three times her length, in two minutes and fifteen seconds. By going ahead with one propeller and astern with the other she could turn completely in her own length in two minutes forty five seconds. She was equally handy going astern.

Career

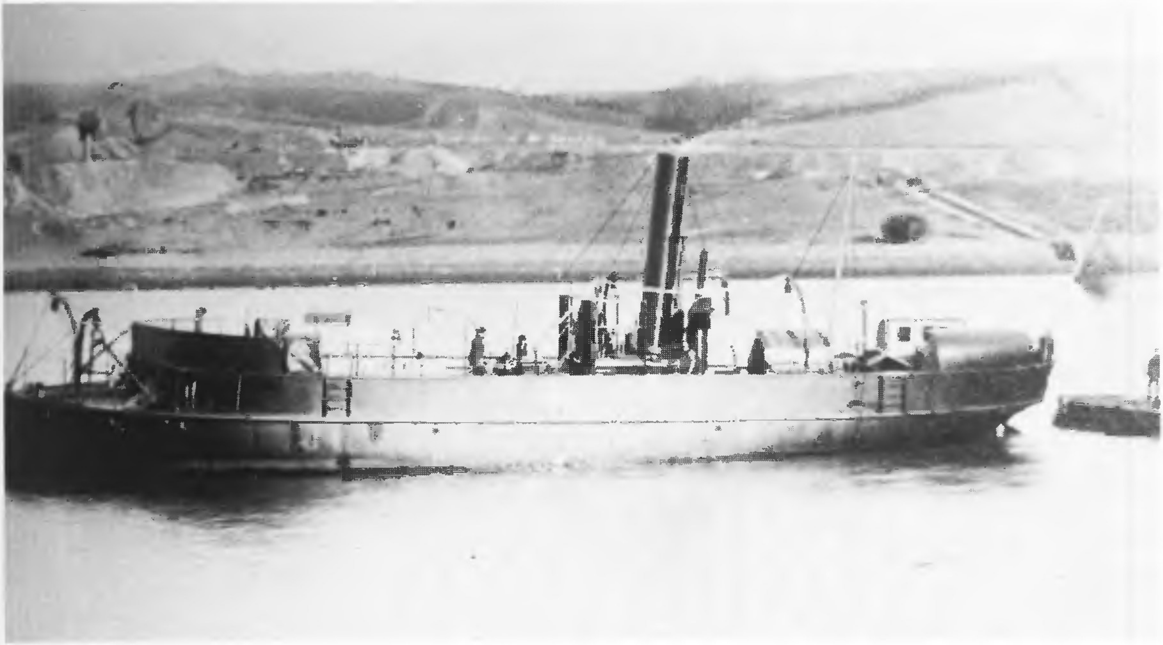
STAUNCH spent her entire service at Portsmouth, initially listed as a twin screw iron gunboat, and later a twin screw gunboat third class for coast defence. By 1904 she was in a separate list for subsidiary duties and was sold for scrapping in 1904.



STAUNCH 1868



MASTIFF 1871



BLOODHOUND as completed, c.1872 Photo : Vickers

MASTIFF BLOODHOUND
Great Britain

Yard & No	Laid Down	Launched	Final Trails	Designer
MASTIFF Low Walker 246	1 Sep 1870	4 Apr 1871	6 Apr 1871	Admiralty
BLOODHOUND Low Walker 247	1 Sep 1870	22 Apr 1871	25 Apr 1871	Admiralty

Displacement	250 tons.
Dimensions	85 x 26 x 6 [25.9 x 7.9 x 1.8]
Armament	1 - 10 in MLR
Machinery	2 sets single cylinder engines by Ravenhill, Hodgson & Co 200 IHP = 8.5 knots.
Fuel	Coal 20 tons normal. 50 tons maximum.
Complement	30

General

Two of the 20 Admiralty-designed ANT class iron gunboats, enlarged versions of STAUNCH.

Career

Both were initally classed as double screw gunboats. By 1880, BLOODHOUND was tender to the torpedo school VERNON and in the 1880s MASTIFF was tender to the gunnery school EXCELLENT; by 1891 both were classified as twin screw gunboats, 3rd class coast defence.

MASTIFF was renamed SNAPPER in 1914, was on the sale list in 1919 and sold to Thames Shipbreakers Ltd 28 November 1931.

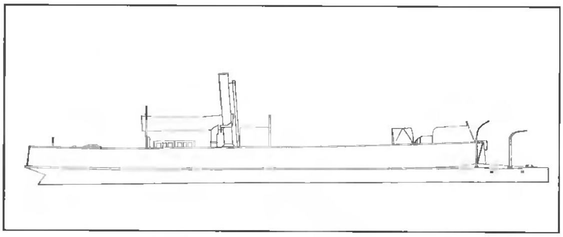
BLOODHOUND was sold to F Bevis 28 June 1921.

MASTIFF about 1880, with the paddle frigate VALOROUS laid up behind her. Photo : MPL

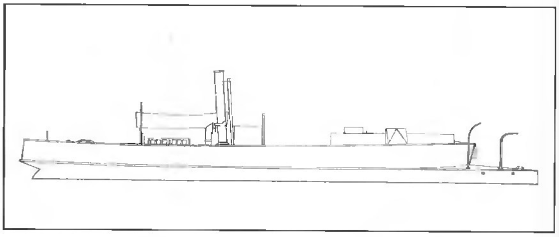
EVER, HYDRA
Netherlands

Yard & No	Laid down	Launched	In Service	Designer
EVER				
Low Walker 270	3 Nov 1871	15 Oct 1872	22 Sep 1873	G Rendel
HYDRA				
Low Walker 271	3 Nov 1871	17 Oct 1872	Sep 1873	G Rendel

Displacement	170 tons.
Dimensions	81 x 25 x 6 [25.9 x 7.62 x 2.2]
Armament	1 - 9 in. 12½ ton MLR. Rearmed 1888 - 1890 with 1 - 8.2 in (21 cm) BL, 2 -37 mm QF. 1 - 37 mm HRC.
Machinery	2 sets two cylinder compound by Jackson & Watkins. 2 cylindrical boilers IHP 110 = 8 knots.
Complement	22 - 34.



EVER as completed 1873

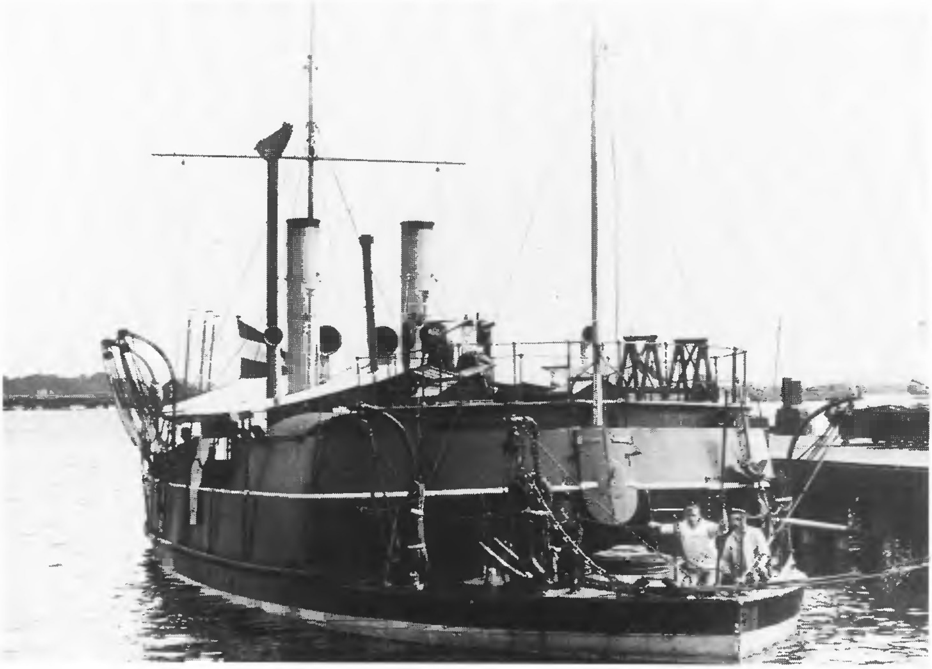


HYDRA as completed 1873

Both from builders' drawings. Note differences in gun housing. Note also the absence of superstructure compared with the photo of EVER later in her career.

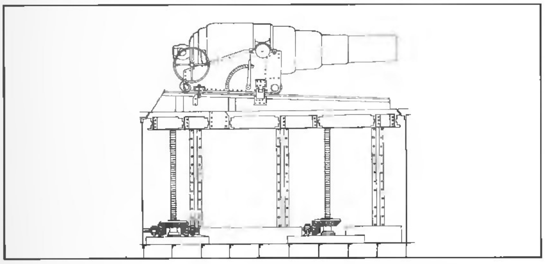
General

Two iron-hulled variants of the STAUNCH type, which were followed by twelve Dutch-built sisters, and sixteen larger WODAN class boats. Their boiler uptakes led to two funnels mounted side by side, the only Rendels to have this arrangement. EVER had the STAUNCH arrangements for the gun mountings.



EVER, much built up after her re-armament in the 1890s. The mast-like device with a shoe at its head is the transmitter for the Vreede semaphore system. Photo : R Neth N

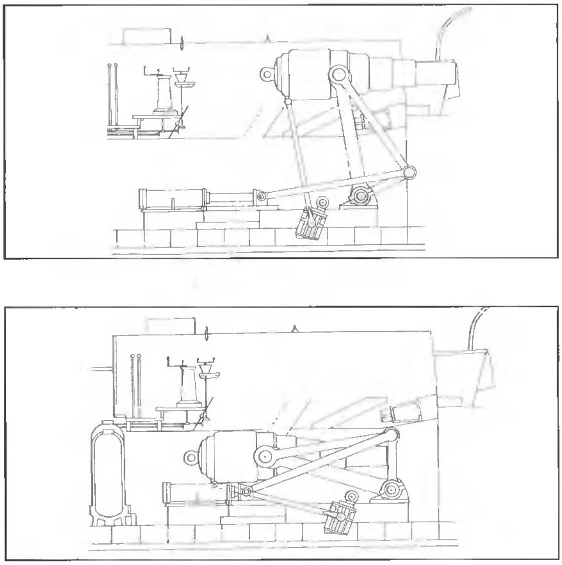
HYDRA had the more sophisticated Moncrieff disappearing mounting which was supposed to be faster operating, however because the gun's recoil was insufficient to lower it fully, this was completed hydraulically. Rate of fire was one round per minute. After firing, the gun was lowered into the hold, loaded and raised again for firing with the muzzle projecting through a port - which could be closed by hinged shutters - in the centre of a fixed bulwark. In practice both types of mounting proved unsatisfactory and in 1875-76 the mechanical and hydraulic arrangements were removed so that the guns were fixed on deck.



Gun mounting as fitted in STAUNCH and EVER

Careers

Early in her career EVER was used as a training ship for naval cadets. In 1884 her main armament was removed but in 1888 - 90 she was rearmed with an 8.2 in BL. In August 1914 she was designated an accommodation ship for the crew of the Ijmuiden quick firing battery, taking up that duty in the following month. From 1921 until 1926, when she was sold for scrapping, EVER again served as an instruction ship for naval cadets.



HYDRA's Moncrieff mounting, above when raised, below, lowered.

HYDRA began her service as a guardship at Vlissingen (Flushing) until relieved in 1885 by her near sister ship VOS. She was rearmed with an 8.2 in BL in 1888. From 1891 she was attached to the Naval Engineers' School at Hellevoetsluis until 1906 when she was removed from the Navy List and sold for scrapping in the following year.

THE CHINESE ALPHABETICALS

General

In 1874 it seemed as if Japan and China were on the verge of war due to a dispute over Formosa. The Japanese laid down the foundation of a modern navy by foreign purchasing; China also saw the need for western armaments, but its organisation was diffuse and its chaotic finances were largely under the control of Europeans, particularly in the Imperial Customs Service under its Inspector General, Robert Hart. Maritime responsibility was divided between four regions each with its own fleet; these forces from North to South and also in order of size in 1894 were as follows:-

Fleet	Region	Responsible Official
Peiyang	Shantung; Yellow Sea	Northern Commissioner of Trade at Tientsin.
Nanyang	Shanghai; Lower Yangtse	Southern Commissioner of Trade at Nanking.
Fukien	Foochow	Superintendent of Foochow Dockyard.
Kwangtung	Canton	Governor General of Canton.

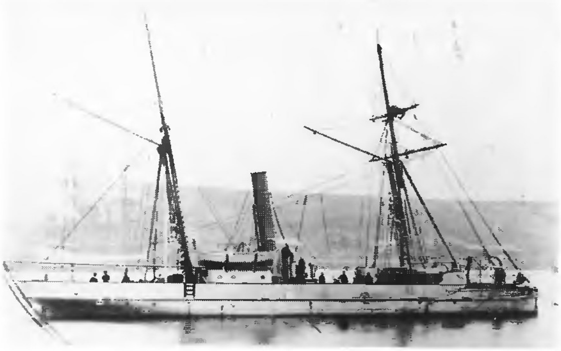
Each fleet saw itself as virtually independent and they failed to operate together in time of war.

Li Hung-Chang, the Northern Commissioner and viceroy of Chihli, the most able and far-seeing Imperial servant, wished to acquire foreign arms and ships. There were problems about money and Li used part of the customs revenue to finance his schemes and thus Robert Hart became involved. Hart was determined to obtain the best possible material at the lowest price and he was firmly opposed to bribes or commissions. His attention was drawn to the virtues of the Rendel gunboats, and after Hart had discussed them with his chief secretary, an ex-midshipman, he ordered his London agent, James Campbell, to obtain estimates from Armstrongs for four gunboats, two to mount a 26½ ton gun and cost £23,000 each and the other pair to have 38 ton guns and cost £33.400 each. The time required for the completion of one vessel was to be nine months and for the second, one month more. It was understood that while the vessels were not to be armoured, iron plates were to be fixed for the protection of the guns and the gun crews.

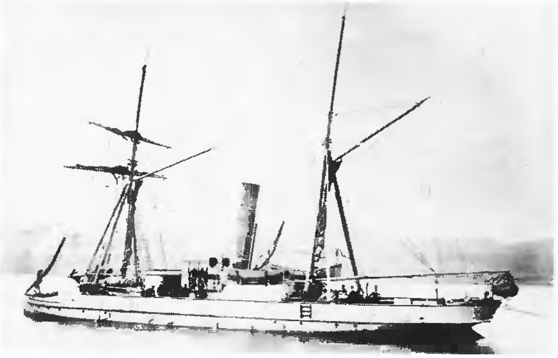
As neither Hart nor Campbell had any shipbuilding expertise it was left to the honour of Armstrongs to provide value for money. However as a safeguard it was stipulated that Armstrongs were to draw up a contract in duplicate for each class of vessel with detailed specifications accompanied by plans and drawings of ship, armament, hydraulic mechanisms etc, just as if they wished some other firm to tender. Armstrongs were to sign the contract covering these plans and specifications as though the contracts had been drawn up by Campbell. As well as guaranteeing delivery time Armstrongs had to supply vessels which would be good seaboats, that could fight their guns in any weather consistent with their safety, provide offensive power with as much invulnerability as possible, be of good speed and be economical in fuel. The guns had to be of high quality and pass British government tests.

It was Campbell who decided the ships' names, the first eleven letters of the Greek alphabet. For registration purposes names had to be given, and Armstrongs suggested that the first pair should be called Lion and Unicorn, but Campbell was unhappy about this and in his own words "after dreaming the matter over while half awake and half asleep on the railway train at last hit on Alpha and Beta and will call the next two Gamma and Delta".

Orders for another four larger boats were placed by the Southern Commisioner, but on arrival in China were appropriated by Li-Hung Chang for his northern fleet on the argument that his fleet was exposed to stormier seas and was closer to the likely enemy Japan, and so needed the largest, best and latest warships. The earlier four gunboats went south to replace the newer vessels and so escaped capture by the Japanese in 1895. A final three were ordered in 1880; there is some doubt as to which of the Chinese authorities actually placed the order, but the ships went to the Peiyang fleet on arrival in Chinese waters and were captured by the Japanese at Wei-Hai-wei with the EPSILON group.



ALPHA in the Tyne on completion, rigged for the passage out to China Photo : MPL



GAMMA ready to sail for China, December 1876 Photo : MPL

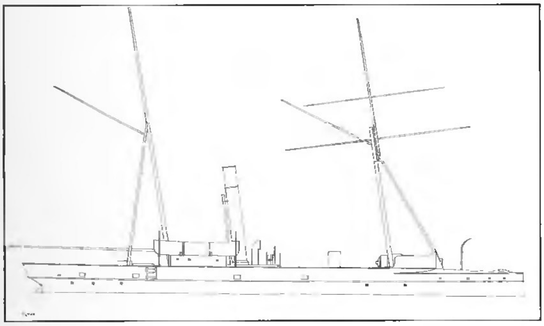
All the gunboats were fitted with sails, usually a topsail schooner rig spread from tripod masts, for the passage out. By the time of the war with Japan some had been reduced to light pole masting, though photographs of others in Japanese hands show the tripod masts still shipped but with no yard or sails.

The guns of the last seven were on paper more powerful than the heaviest guns that the Royal Navy had afloat, the 38 ton MLR's mounted on the DREADNOUGHT. The "Times" for 25 July 1879 drew attention to the apparent superiority in a table.

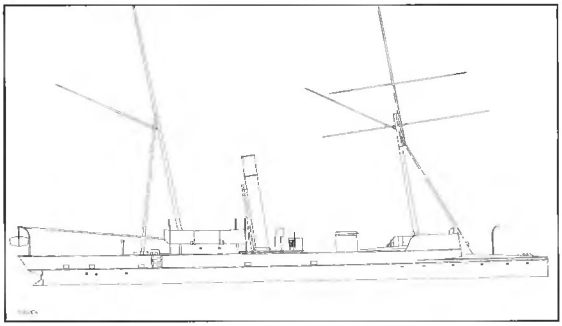
	Gunboat	**DREADNOUGHT**
Weight of guns	35 tons	38 tons
Calibre	11 in	12½ in
Charge	235 lb	160 lb
Weight of shot	536 lb	818 lb
Velocity in ft/sec	1820	1444
Muzzle Energy (total in ft tons)	12,311	11,727
Elevation for 1000 yds range	0° 39′	1° 54′
Elevation for 3500 yds range	3° 26′	6° 06′

The shells were raised from the magazines by a hydraulic lift and were then placed on a four-wheeled trolley which ran on a track to the muzzle of the gun. This had to be run right back by hydraulic power, the muzzle depressed and the charge and the shot loaded by a hydraulic rammer mounted under the sloping gun shield. The gun was then run out and given the appropriate elevation.

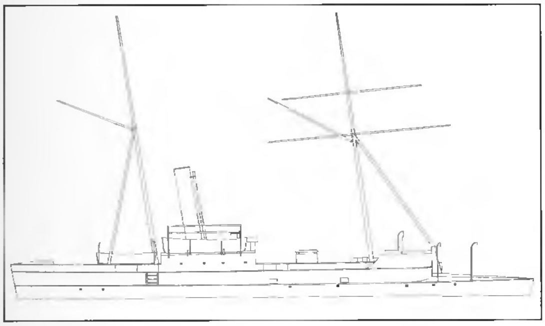
The mounting was described by a contemporary thus "Two heavy iron beams in the forepart of the vessel are placed side by side on a level with the deck and parallel with the keel; on these beams are bolted frames analogous to the crosshead guides of a horizontal engine and the trunnions of the gun are fitted inside blocks, these last taking the place of the crosshead. Thus arranged, the gun can slide back and forth through a range of about three feet. The preponderance of the breech end is supported by two secondary parallel bars inside the main gun-beams. These are hinged at the rear end, while at the forward end they are carried on the crosshead of a vertical



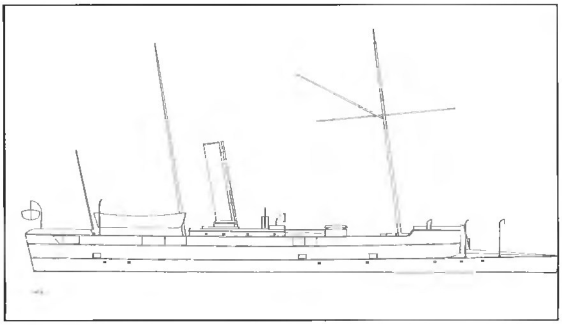
ALPHA 1876



DELTA 1876



EPSILON 1879



IOTA 1881

hydraulic ram fixed under the deck. The breech end of the gun is supplied with a hoop and lugs: these lugs rest on the two secondary bars near the hinged ends, and thus by causing the hydraulic ram to rise or fall the gun can be elevated or depressed at will". "To run the gun in and out two hydraulic cylinders are used, one of which is fixed horizontally on each side beam, the crossheads of the rams taking hold of the trunnion side blocks".

"ALPHABETICALS"

Imperial Chinese Government

Yard & No	Builders Name	Chinese Name	Laid down	Launched	Trials	Designer
Low Walker 327	**ALPHA**	**LUNG HSIANG***	21 Sep 1875	23 Feb 1876	8 Jun 1876	G Rendel
Low Walker 328	**BETA**	**HU WEI**	21 Sep 1875	13 Apr 1876	8 Oct 1876	G Rendel

Displacement	340 tons
Dimensions	115 x 27 x 7 [35 x 8.2 x 2.29]
Armament	1 x 11 in 26½ ton MLR
Armour	Fixed shield to gun.
Machinery	2 sets simple engines by G Thompson. IHP 235 = 10 knots. Cylindrical boilers.
Fuel	Coal. 40 tons normal. 50 tons maximum

Yard & No	Builders Name	Chinese Name	Laid down	Launched	Trials	Designer
Low Walker 334	**GAMMA**	**FEI TING**	27 Dec 1875	14 June 1876	27 Dec 1876	G Rendel
Low Walker 335	**DELTA**	**TS'E TIEN**	27 Dec 1875	23 June 1876	26 Dec 1876	G Rendel

Displacement	420 tons
Dimensions	120 x 30 x 8 [36x 9.14 x 2.44]
Armament	1 x 12 ½ in 38 ton MLR, 2 x 9 pdrs, 2 mgs
Armour	Fixed shield to gun
Machinery	2 sets simple engines by G Thompson. IHP 270 = 9.6 knots. Cylindrical boilers.
Fuel	Coal. 50 tons normal. 60 tons maximum

Yard & No	Builders Name	Chinese Name	Laid down	Launched	Trials	Designer
Low Walker 374	**EPSILON**	**CHEN TUNG**	9 Sep 1878	20 Jan 1879	9 Jul 1879	G Rendel
Low Walker 375	**ZETA**	**CHEN HSI**	9 Sep 1878	22 Mar 1879	9 Jul 1879	G Rendel
Low Walker 376	**ETA**	**CHEN NAN**	9 Sep 1878	5 Feb 1879	9 Jul 1879	G Rendel
Low Walker 377	**THETA**	**CHEN PEI**	9 Sep 1878	27 Mar 1879	9 Jul 1879	G Rendel

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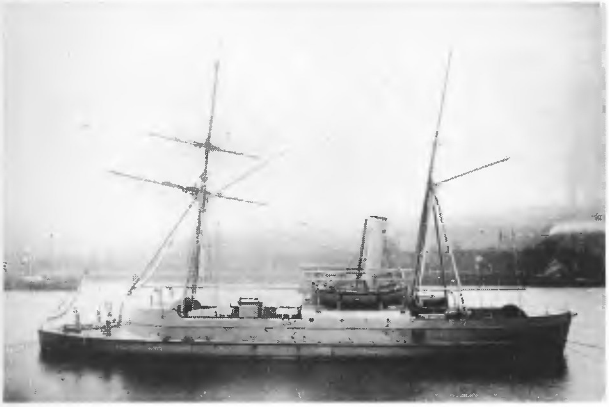
* Throughout the book I have used the Wade-Giles transliteration for Chinese warship names in preference to the current Pinyin as all naval reference books covering the period dealt with in this book use the former.

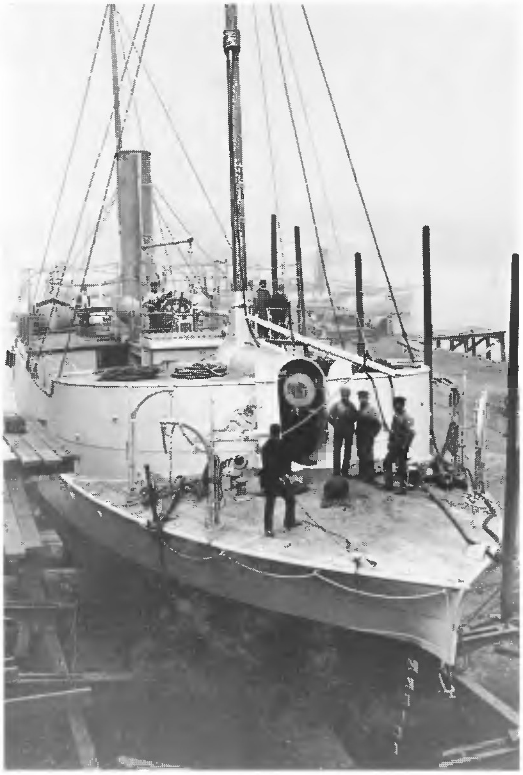
Displacement	490 tons
Dimensions	125 (127 oa) x 29 x 9 ft 6 in [38.1 (38.7oa) x 8.84 x 2.9]
Armament	1 x 11 in 35 ton, 23 cal MLR, 2 x 12 pdr BL, 2 mgs
Armour	$^{3}/_{8}$ in fixed shield to gun. $^{3}/_{16}$ in deck over magazines. $^{1}/_{2}$ in screen for gunner and helmsman
Machinery	2 sets horizontal compound by R & W Hawthorn. Cylindrical boilers. IHP 472 = 10.2 knots, 9 knots astern
Fuel	Coal. 50 tons normal. 60 tons maximum. Radius 1400 miles
Complement	27.

Yard & No	**Builders Name**	**Chinese Name**	**Laid down**	**Launched**	**Trials**	**Designer**
Low Walker 411	**IOTA**	**CHEN CHUNG**	2 Jun 1880	9 Dec 1880	27 Apr 1881	G Rendel
Low Walker 412	**KAPPA**	**CHEN PIEN**	2 Jun 1880	31 Dec 1880	29 Apr 1881	G Rendel
Low Walker 413	**LAMBDA**	**CHEN HAI**	2 Jun 1880	22 Dec 1880	28 Apr 1881	G Rendel

Displacement	500 tons
Dimensions	125 x 29 x 9ft 6in [38.1 x 8.84 x 2.9]
Armament	1 x 11 in 35 ton MLR, 2 x 4 in BL, 2 mgs
Armour	As EPSILON
Machinery	2 sets horizontal compound by R & W Hawthorn. Cylindrical boilers. IHP 455 = 10.4 knots
Fuel	Coal. 60 tons



EPSILON in the Tyne between completion and delivery, 1879
Photo : MPL



LAMBDA completing on the patent slip, 1881
Photo : NCL

Careers

None took any notable part in the Sino-Japanese War of 1894-1895. Six were surrendered at Wei Hai Wei and taken into the Japanese Navy and renamed,

CHEN TUNG as CHIN TO, CHEN HSI as CHIN SEI,
CHEN NAN as CHIN NAN, CHEN PAI as CHIN HOKO,
CHEN CHUNG as CHIN CHU and CHEN PIEN as CHIN PEN.

LUNG HSIANG was discarded about 1895. FEI TING was lost by fire in about 1905 and TS'E TIEN was discarded the same year. The fate of the CHEN HAI is unknown but the last surviving ship of the class, the HU WEI, took part in the civil war that followed the revolution of 1911.

The Japanese boats were removed from the effective list in about 1906 and broken up in 1906/7; their 4in BL had been replaced by 3in QF in about 1898. They saw no operational service because their projectiles had become corroded and the Japanese doubtless felt it uneconomical to have new ones made, because of the obsolescence of the main guns.

AUSTRALIAN COLONIAL GUNBOATS

General

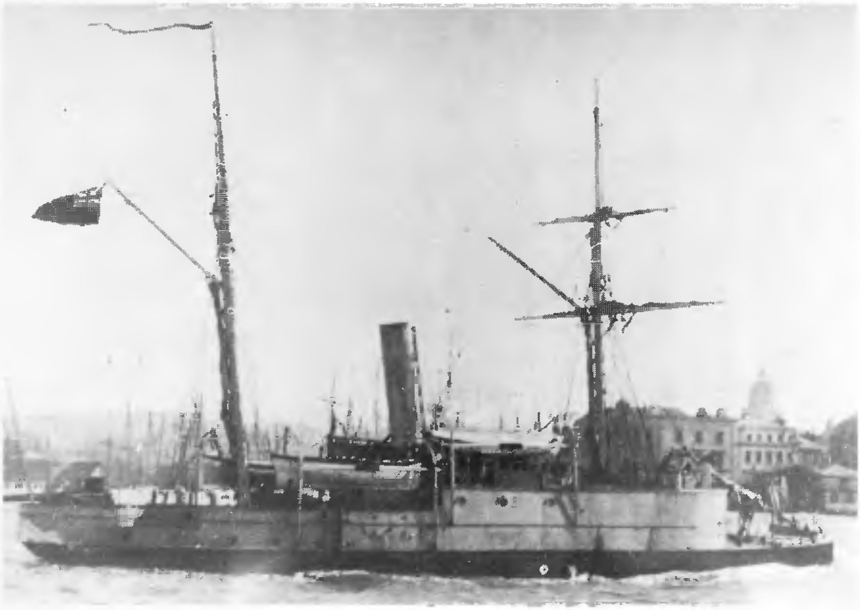
Until 1901 Australia was made up of separate self-governing colonies, four of which, Victoria, New South Wales, Queensland and South Australia, maintained small squadrons for local defence to augment the Royal Navy's Australia Squadron. After the Russian war scare of 1878 there was agitation in the colonial parliaments for a more effective naval defence, which was met both by strengthening the Imperial squadron and by the procurement of warships by the colonial governments. Enquiries were made of a number of firms of warship builders, and a short catalogue of ships offered by Armstrongs was printed in the New South Wales Parliamentary Papers for 1882. (Table 2/2.) These ranged from a simple Rendel gunboat to a fully fledged protected cruiser of the ESMERALDA type. New South Wales did not acquire ships from the list, but Queensland, South Australia and Victoria all ordered ships from Armstrongs. South Australia's PROTECTOR was classed as a cruiser but was really an enlarged Rendel and is dealt with in Chapter 8 as a small cruiser. Queensland and Victoria each ordered two gunboats differing from the pure Rendel type by having lighter guns as their main armament and a heavier secondary armament. Queensland's two, GAYUNDAH and PALUMA, were sisters. Victoria's pair, ALBERT and VICTORIA differed, ALBERT being practically identical to the Queensland gunboats with VICTORIA somewhat larger.

TABLE 2/2
ARMSTRONG CATALOGUE OF GUNBOATS & CRUISERS 1882

TABLE of Dimensions, Armaments, and Prices of Unarmoured Gunboats and Cruisers,
as supplied by Sir W G Armstrong & Co

	B	B1	C	D	E	F	F1	G	H	I
Speed (Kts)	10	10	10	12	12	14	14	14	16	17
Dimensions:										
Length	125'	115'	125'	140'	140'	180'	180'	180'	220'	270'
Breadth	29'	25'	29'	27'	27'	30'	30'	30'	35'	42'
Depth	12'3"	12'6"	12'3"	13'6"	13'6"	16'	16'	16'	28'9"	29'3"
Mean Draught	10'3"	9'6"	10'3"	11'	11'	12'	12'	12'	15'	18'6"
Engine IHP	450	400	450	800	800	1,500	1,500	1,500	3,200	5,500
Armament	1 x 10" 2 x 13pr	1 x 8" 1 x 6" 2 x 9pr	1 x 11" 2 x 13pr	1 x 10" 2 x 13pr	1 x 11" 2 x 13pr	1 x 10" 4 x 13pr	1 x 8" 5 x 6" 5 mg	1 x 11" 4 x 13pr	2 x 10" 4 x 40pr 2 x 9pr	2 x 10" 6 x 6" 2 x 9pr
Price (£)	33,152	27,150	37,140	39,152	43,500	61,800	63,400	65,800	119,700	170,000
Additions										
if made 10 feet longer and prepared for torpedo add £									2,000	3,000

From: Legislative Assembly, New South Wales, Defence Papers Relating to Unarmoured Gun-Boats, Cruisers and Guns. 18th October 1882



ALBERT leaving Portsmouth on passage out to Australia, 1884 Photo : ROM

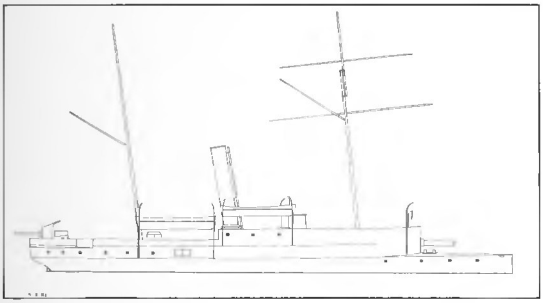
ALBERT
State of Victoria

Yard & No	Laid Down	Launched	Final Trials	Designer
Low Walker 454	20 Sep 1882	6 June 1883	5 Jan 1884	G Rendel

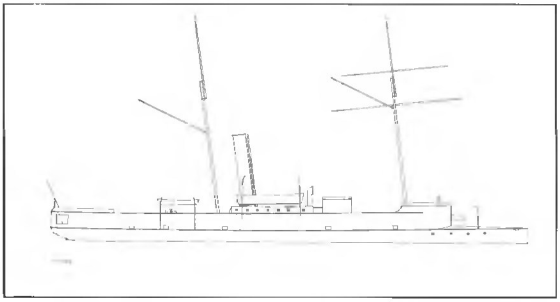
Displacemant	361 Tons
Dimensions	115 x 25 x 9 ft 6 in [35,05 x 7.62 x 3.05]
Armament	1 x 8 in 12 ton BL (180 lb projectile), 1 x 6 in BL, 2 x 9 pdr BL, 2 mg.
Armour	Thin belt in way of magazines. 1 in steel breastwork around main gun.
Machinery	2 sets horizontal compound by R & W Hawthorn. IHP 376 = 10.18 knots.
Fuel	Coal. 50 tons.
Complemant	55.

Career

In company with VICTORIA and the torpedo boat CHILDERS, ALBERT sailed for Australia in February 1884. The Government of Victoria offered the services of all three for the first Sudan War of 1884-85 and they were diverted to Suakin but as there was no employment there they sailed for Melbourne in June 1884. ALBERT was a poor seaboat and spent most of her time in the harbour of Port Phillip. She was transferred to the Department of Works in 1897 and used as a blasting vessel; requisitioned and bought in 1917 by the RAN for conversion to a tug but as the cost was prohibitive she was placed on the disposal list in 1917, sold that year and converted to an oil lighter.



ALBERT 1884



VICTORIA 1884

VICTORIA

State of Victoria

Yard & No	Laid Down	Launched	Final Trials	Designer
Low Walker 455	30 Sep 1882	25 Jun 1883	25 Jan 1884	G Rendel

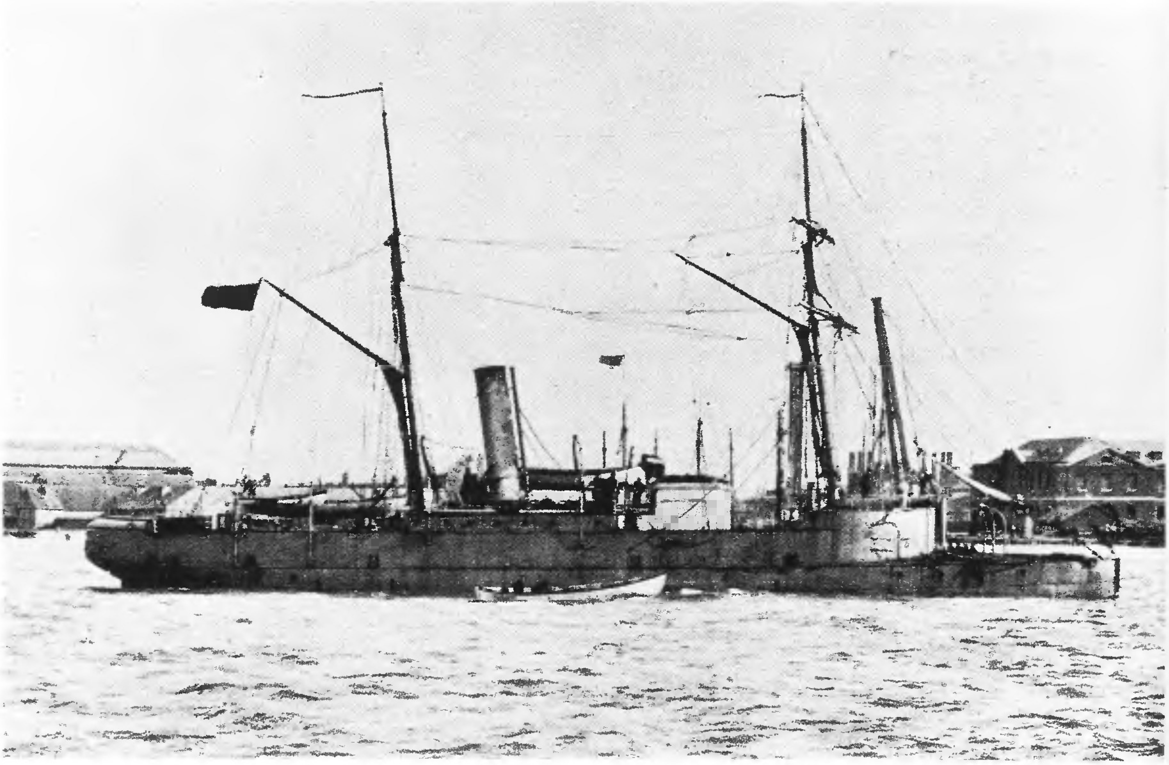
Displacement	544 tons
Dimensions	140 x 27 x 11 [42.67 x 8.23 x 3.35]
Armament	1 x 10 in 25 ton BL, 2 x 12½ pdr BL.
Machinery	2 sets horizontal compound by R & W Hawthorn. IHP 807 = 12.58 knots.
Fuel	Coal. 70 tons normal. 85 tons maximum.
Complement	53

General

The largest and most heavily armed of the Australian gunboats. The 10 in gun fired its 400 lb projectile over the bows through a port with no lateral training, with the 12½ pdrs mounted aft. In 1888 she was rearmed with a single 8 in BL forward and 1 x 6 in aft with the 12½ pdrs moved amidships. At the same time she was fitted with a 20,000 candle power searchlight.

Career

Sold to the government of Western Australia in 1896 for use as a tug and subsequently she was sold in 1902 as a commercial tug being employed first in Western Australia and from 1917 in Sydney. Sold for scrap in 1920, abandoned as a hulk in Kerosene Bay, Sydney and broken up in 1935.



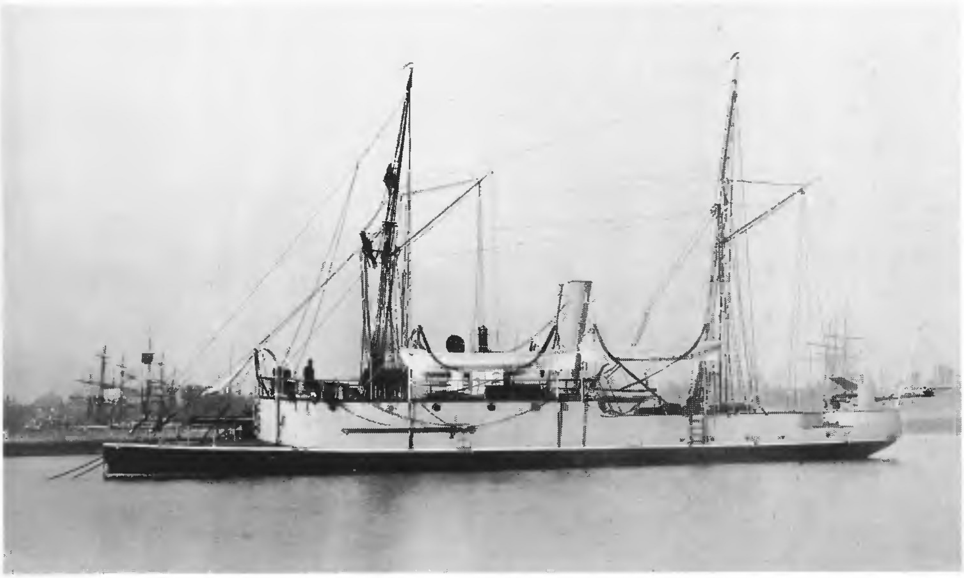
VICTORIA at Portsmouth, 1884, before leaving for Australia Photo : Gibbs

PALUMA GAYUNDAH

State of Queensland

Yard & No	Laid down	Launched	Final Trials	Designer
PALUMA Low Walker 469	26 Jun 1883	6 May 1884	26 Sep 1884	Unknown
GAYUNDAH Low Walker 470	26 Jun 1883	6 May 1884	26 Sep 1884	Unknown

Displacement	385 tons.
Dimensions	115 x 26 x 9 ft 6 in [35.05 x 7.92 x 2.9]
Armament (Designed)	1 x 8 in BL, 1 x 6 in BL, 2 x 1½ in Nordenfelt, 2 mgs.
Machinery	2 sets horizontal compound by R & W Hawthorn. IHP 385 = 10.572 knots.
Fuel	Coal. 50 tons normal, 58 tons maximum.
Complement	55.



GAYUNDAH in pristine condition before departure for Australia, 1884

Photo courtesy of Miss Elisabeth Rowell

General

These two were almost identical to ALBERT. Their names were aboriginal for Thunder and Lightning. The bow mounted 8 in guns were incapable of lateral training. For the voyage out to Australia they were rigged as topsail schooners. While employed as a RN surveying ship a wooden cabin was built on PALUMA's stern in place of the 6in gun with a chartroom in place of the never fitted 8 in gun forward. In 1899 2 x 5in BL were mounted forward. GAYUNDAH'S after 6in was fitted in 1901 and replaced by a 4.7 in gun in 1905 with 2 x 12 pdrs substituted for the 1½in Nordenfelts.

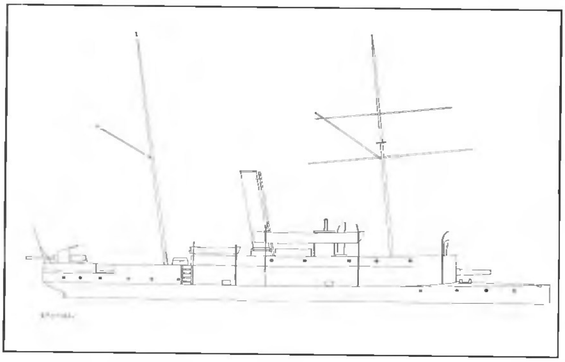
Careers

GAYUNDAH

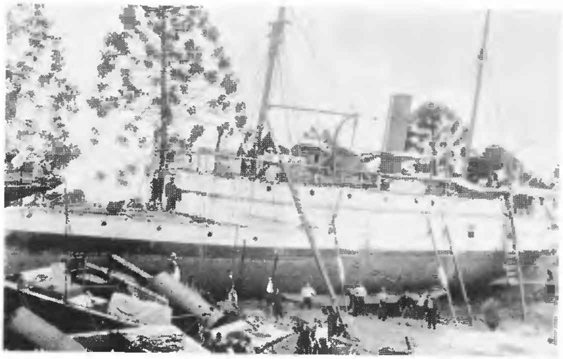
On the formation of the Australian Commonwealth Naval Force in 1902 GAYUNDAH was incorporated into it and used for training men from Queensland and in 1911 became part of the RAN. Her bow was built up in 1914. Just before the outbreak of the First World War GAYUNDAH was based at Port Jackson, N.S.W. On August 4 – one day before Australia's declaration of war – she sailed north to act as guardship at Moreton Bay. Later she was stationed at Brisbane. In 1915 she surrendered one gun to the survey ship FANTOME so that the latter could serve in the Bay of Bengal. GAYUNDAH served as a coast patrol ship in Spencer Gulf until July 1918, having been recommissioned at Sydney in December 1917 with an armament of 1 x 4.7in and 2 x 12pdr guns. She was sold in 1921 for use as a lighter, and was hulked at the same time. In 1930 she sank at her moorings in Brisbane river but was refloated and was used as gravel barge until 2 June 1958 when she was beached at Woody Point, Moreton Bay, Queensland, where she remains to this day.

PALUMA

From 1885 to 1895 PALUMA was leased to the Royal Navy for the purpose of conducting a survey of the Queensland coast and during this period she had six Royal Navy officers on her books. In February 1893 when her engines and boilers were out of action due to a refit, she was beached in the Brisbane botanic gardens by an exceptional flood of the Brisbane river. Thirteen days later a further flood enabled her to be re-floated. Taken into the Australian Commonwealth Naval Force 1902 as a training ship subsequently joining the RAN in 1911. She was sold to the Victorian Public Service Department in 1916 and renamed RIP, and was employed tending lights in Port Phillip and blasting to deepen channels. Broken up 1951.



GAYUNDAH 1884



PALUMA high and dry in the Brisbane Botanical Gardens, February 1893
Photo : NAI

HANDY

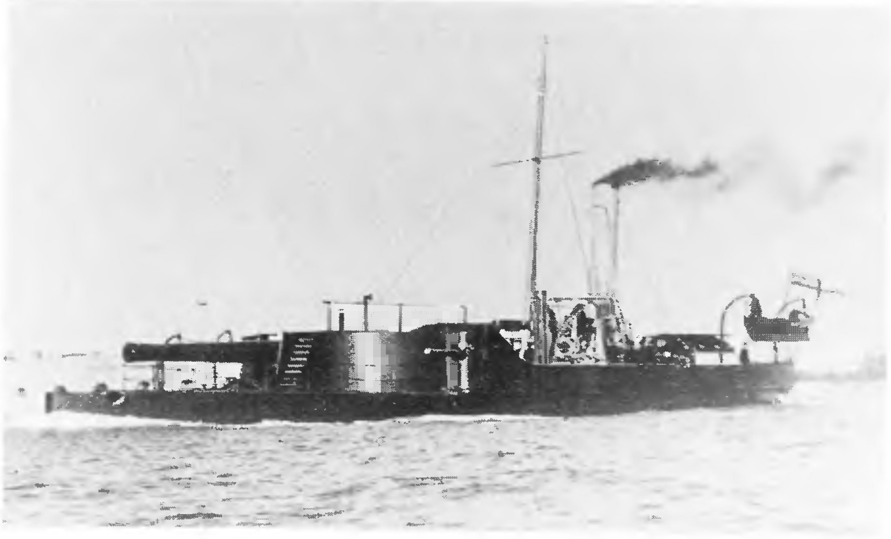
Great Britain

Yard & No	Laid down	Launched	Final Trials	Designer
Low Walker 451	1 Aug 1882	30 Dec 1882	12 Jul 1883	Not Known

Displacement	523 tons.
Dimensions	115 x 37 x 8 [33.05 x 11.28 x 2.01]
Armament	Varied; but fitted for breechloading guns only.
Machinery	1 set compound engines by Ross & Duncan. IHP 315 = 9 knots. 9.049 knots on trial.
Fuel	Coal 20 tons.

General

Built for gun mounting tests with a single screw only, since manoeuvrability was not needed. Bought by the Royal Navy in 1884 and renamed EXCELLENT in 1891. During her career she carried a wide variety of guns and mountings for test purposes including a 65 ton 13.5in gun as mounted in the ROYAL SOVEREIGN class and in 1895 the 12in mounting designed for the MAJESTIC's. Before World War I she carried a single 9.2 Mark X in a turret. Between 1912 and 1915 the Navy List gives an official armament of 1 x 7.5in and 1 x 4in guns.



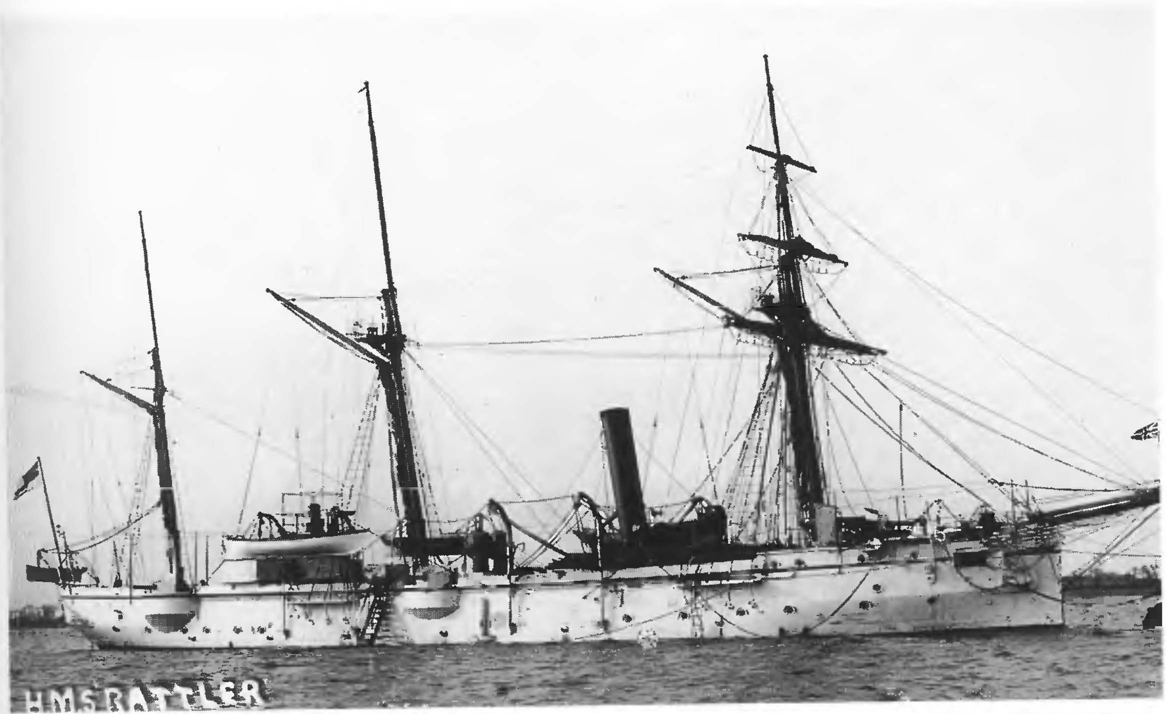
HANDY mounting a 12in gun, about 1895
Photo : NAI

While in action off the Belgian coast in 1914-1915 she mounted a 9.2 in gun which had neither turret nor shield protection. After being withdrawn from the Belgian coast, she was renamed CALCUTTA in November 1916. Again renamed SNAPPER II in August 1917 she was sold for commercial use 27 April 1922, renamed DEMON and used as a crane lighter. In 1995 her hull and part of her engines were still in existence at Pounds shipbreaking yard at Portsmouth.

RATTLER WASP
Great Britain

Yard & No	Laid down	Launched	Final Trials	Designer
RATTLER Elswick 491	15 Aug 1885	4 Aug 1886	4 Dec 1886	DNC
WASP Elswick 492	15 Aug 1885	13 Sep 1886	31 Dec 1886	DNC

Displacement	670 tons.
Dimensions	165 (173 ft 6 in oa) x 29 x 10 ft 8½ in [49.9 (52.) x 8.8 x 3.3]
Armament	6 x 4 in BL, 2 Nordenfelt mg, 2 Gardner mg.
Protection	Deck 5/16 in flat, 7/16 in slopes.
Machinery	RATTLER Hawthorn Leslie, WASP North Eastern Marine Engineering Co. Single set horizontal triple expansion. Two single ended boilers. RATTLER. Trials ND IHP 658 = 11.53 knots. FD 1291 = 14.08 knots. WASP. Trials ND IHP 694 = 10.63 knots.
Fuel	Coal 60 tons normal, 190 tons maximum.
Complement	76



RATTLER in colonial white paint, 1900-01

Photo : NMM ECQ-1-8

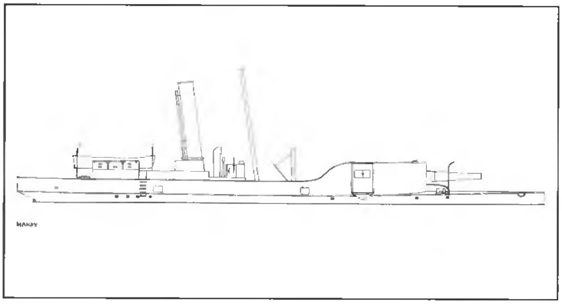
General

Built to an Admiralty design as two of the BRAMBLE class, one of a series of similar classes of gunboats for colonial service. They were composite hulled and carried a barquentine rig. The mixed iron and wooden construction was a new experience for Elswick and the Report Book describes it of "special character which would add to the yards experience".

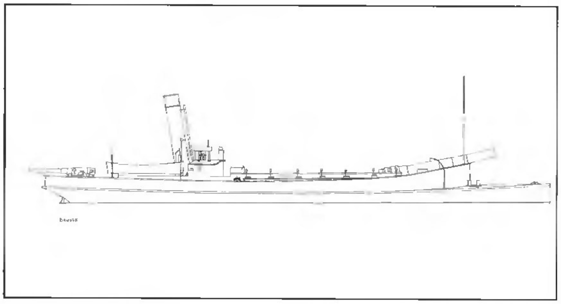
Careers

RATTLER was reduced to harbour service in 1905 after many years service on the China station and in September 1919 was renamed DRYAD as part of the navigation school of that name. Sold October 1924 to A Butcher & Son.

WASP foundered without trace and with the loss of all 73 on board while on passage from Singapore to Hong Kong in October 1887.



HANDY, c.1900



DRUDGE, 1888

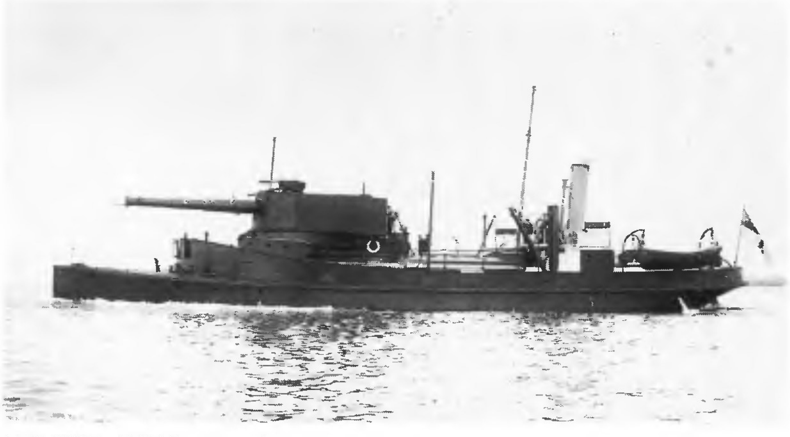
DRUDGE
Great Britain

Yard & No	Laid Down	Launched	Final Trials	Designer
Low Walker 504	12 Jan 1887	15 Jun 1887	23 Aug 1887	Not Known

Displacement	890 tons. Registered tonnage = 438
Dimensions	125 x 35 ft 2 in x 12 ft 5 in [38.1 x 10.7 x 3.8]
Armament	Varied
Machinery	1 set VTE by Wallsend Slipway & Engineering Co. IHP 300 = 8 knots.

General

After HANDY was sold to the Royal Navy, a substitute was built by Armstrongs to test their guns and mountings. She was originally registered as a merchant ship and hence was measured for registered tonnage. She was also used to carry waste from the iron works out to sea; her plans show a slag hopper on each side, each fitted with seven hinged flaps to their bottom to allow for easy discharge of the slag. She was considerably larger than the original Rendel gunboats in order to carry complete mountings and guns; as this arrangement allowed the guns to be trained two screws were not therefore necessary.

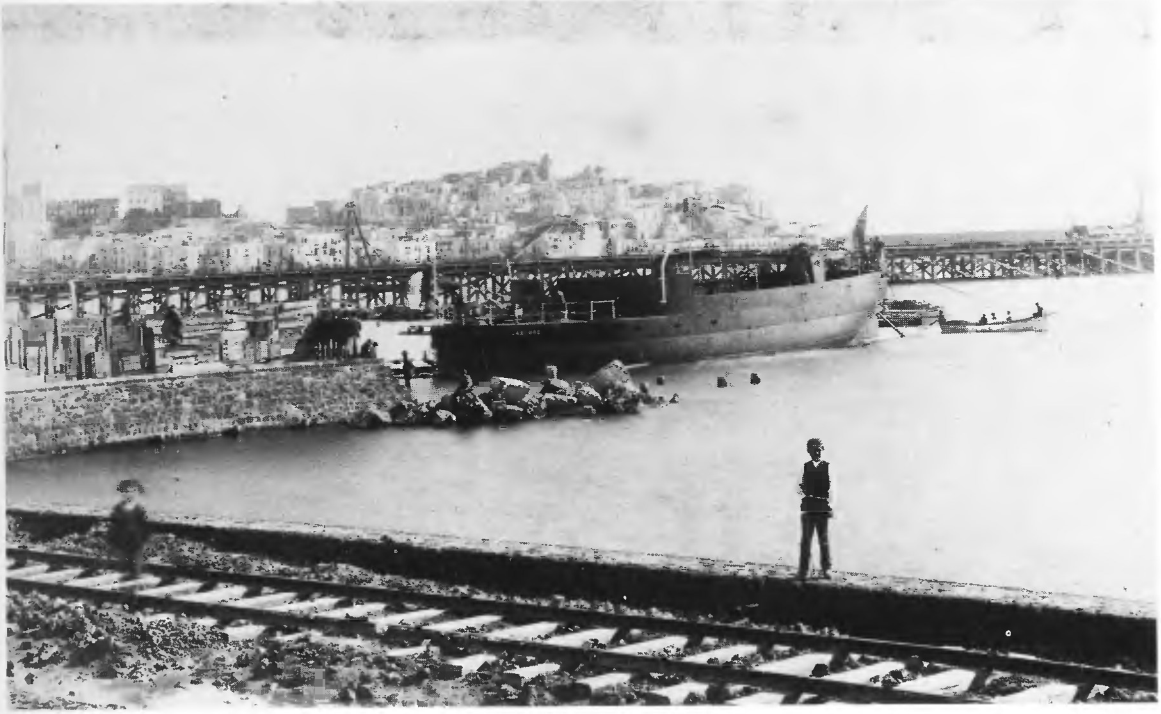


DRUDGE, 1907-8, mounting a 9.2in gun, Mk XI on a Mk VIII mounting
Photo : NMM ECJ-1

Career

She was bought by the British Government and classified as a "screw gunboat for gun trials" on 28 February 1901; renamed EXCELLENT (base ship) 21 November 1916, again renamed DRYAD (Navigation School Ship) on 26 January 1919, and reverted to the name of DRUDGE in 1919. The Navy List, however, list her as DRUDGE from April 1918 to July 1919, and record her as being used as an armourers' probably a hulk and workshop at Portsmouth.

DRUDGE was sold to Stanlee Shipbreaking and Salvage Co. Ltd., H.M. Dockyard, Dover and used as a salvage vessel. By 1946 ownership had passed again to Overseas Towage & Salvage Co. Ltd., London and in 1948 DRUDGE was sold to a French firm "Les Abelles", Soc de Remorq et de Sauvetage, Havre, and renamed FRANÇOIS QUERE; Lloyds Casualty Returns for the quarter ended 31 March 1969 records that FRANÇOIS QUERE had been broken up in France.



CASTORE at Pozzuoli immediately after her launch, September 1888

Photo courtesy Miss Elisabeth Rowell

CASTORE POLLUCE

Italian Ministry Of War

Yard & No	Laid down	Launched	Final Trials	Designer
CASTORE Elswick 512	22 Feb 1887	September1888 at Pozzuoli	1889	Phillip Watts
POLLUCE Elswick 513	22 Feb 1887	October 1888 at Pozzuoli	1889	Phillip Watts

Displacement	667 tons.
Dimensions	115 (120 ft 6 in oa) x 37 x 9 ft 2 in [35.05 (36.73) x 11.27 x 2.74]
Armament	1 x 40 cm 32 cal 117 ton Krupp BL.
Machinery	2 sets VTE by Wallsend Slipway and Engineering Company. Designed IHP 350 = 8 knots. Trials IHP 364 = 8.5 knots.
Fuel	Coal. 20 tons normal. 70 tons maximum.
Complement	42

General

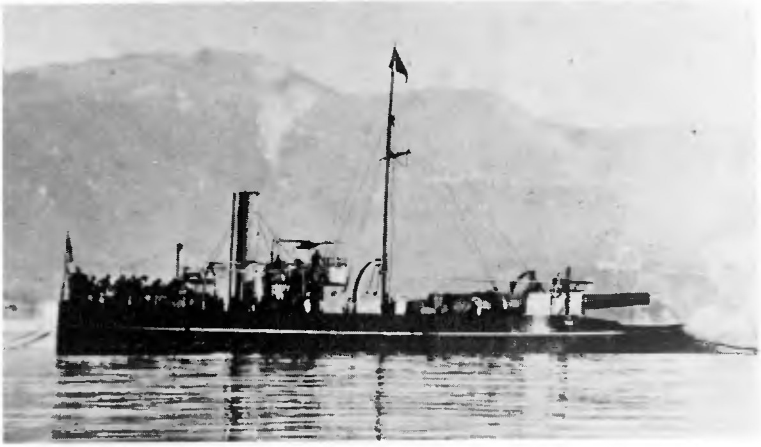
This pair had a length ration of only 3.1:1. The single gun, the largest ever mounted in an Armstrong gunboat, accounted for 18% of their displacement. They were not built for the Italian Navy, but for the Ministry of War as trial ships. They must have been regarded as quite incapable of sailing in open seas because after completion they were disassembled and shipped out to Armstrong's new works at Pozzuoli near Naples, where they were re-assembled by Herbert Rowell who had been put in charge of designing and erecting the hulls at Elswick; the re-assembly was done under very primitive conditions, the only warships to emanate from the place.

The Krupp guns weighed 117 tons firing a 1,980 lb shell with a mv. of 1837 ft-sec and had a maximum elevation of 13 degrees. CASTORE's gun was removed in 1888-89 and POLLUCE's in 1899 and both were re-armed after transfer to the Navy with a single 4.7in gun.

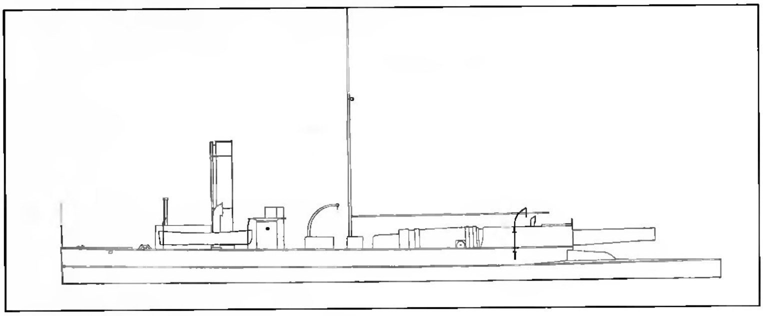
Careers

CASTORE commissioned into the Royal Italian Navy as a gunboat, 18 July 1891. Disarmed and reclassified as a barge in 1899 and recategorised as a minelayer 1904. From November 1915 employed as a floating torpedo testing craft; discarded 8 October 1925.

POLLUCE as CASTORE to 1899. Discarded in 1911.



POLLUCE firing her 120 ton Krupp gun, c 1890 Photo : ROM Collection



CASTORE and POLLUCE as completed 1888.

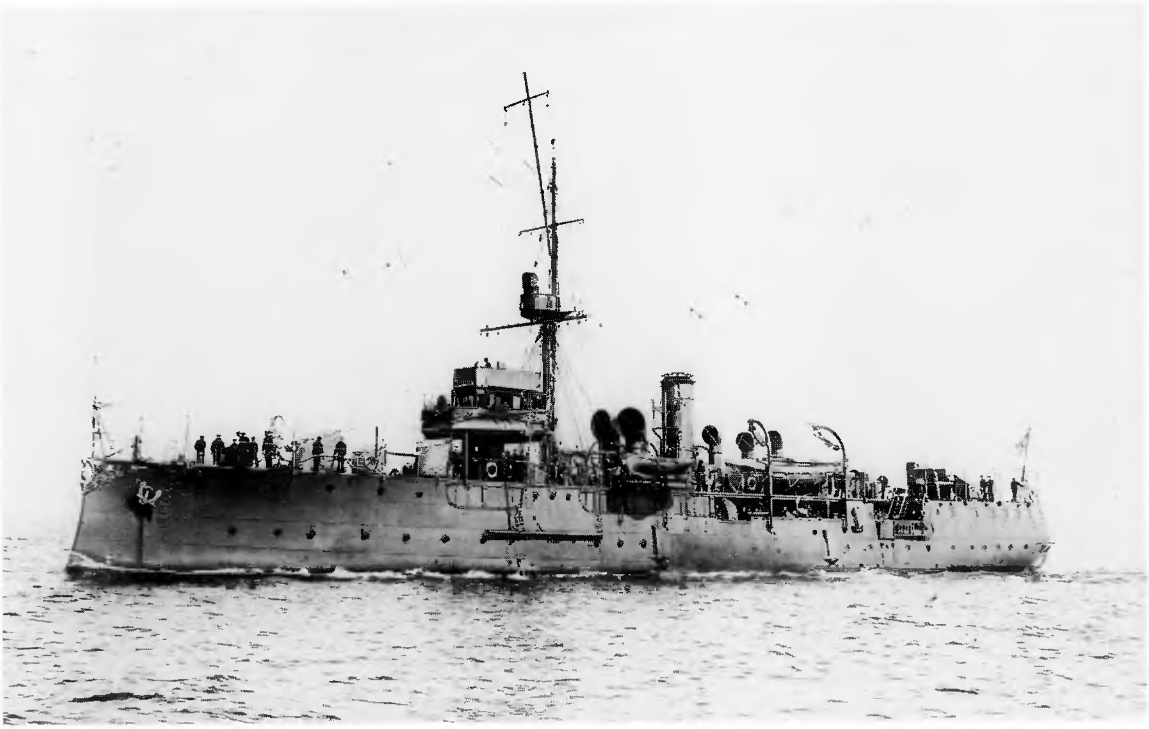
ARMOURED RIVER GUNBOATS

ROSARIO PARANA

Argentina

Yard & No	Laid down	Launched	Completed	Designer
ROSARIO Elswick 811	21 Aug 1907	8 Jul 1908	15 Jun 1909	J R Perrett
PARANA Elswick 812	16 Sep 1907	28 Apr 1908	8 Jun 1909	J R Perrett

Displacement	1000 tons. (1055 tons on trials).
Dimensions	240 (250 ft 9 in oa) x 32 x 7 [73.1 (76.2 oa) x 9.9 x 2.13]. Freeboard amidships 6 ft 7 in.
Armament	2 x 6 in, 13 cal howitzers, 6 x 3 in 50 cal QF, 4 x 75 mm 12 cal landing guns. 8 mg.
Armour	Krupp. 3 in side over machinery. Nickel steel 2 in forward aft and over magazines. 4 in deck over engines and boilers. 1½in bulkheads fore and aft.
Machinery	2 set VTE by Vickers. Yarrow wt boilers. IHP 1650 = 15 knots. Trials PARANA = 15 knots. ROSARIO = 15.25 knots.
Fuel	Coal. 50 tons normal. 115 tons maximum.
Complement	128



ROSARIO under way, soon after completion. Note the 6in howitzer forward of two, sided 3in guns on the forecastle. Photo : Vickers

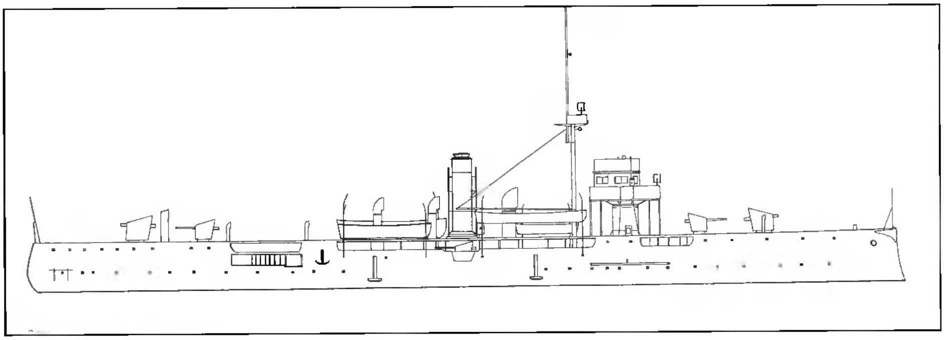
General

Argentina has extensive waterways on its north-eastern frontier with the river Uruguay forming the boundary with the Republic of that name and with the Parana, Paraguay and Pilcomayo rivers separating her from Paraguay. There was much riverine fighting in the War of the Triple Alliance – Argentina, Brazil and Uruguay – against Paraguay in 1864-70. All these countries had flotillas of armed river craft. In 1893 the Parana river was the scene of fighting between government warships and those commanded by rebels.

In 1905 the Argentine government sought tenders for armoured river gunboats and the pair were ordered from Armstrongs in June 1907. ROSARIO and PARANA were designed primarily as river gunboats which accounted for their main armament being howitzers, useless for sea warfare but well suited for river action. The requirements of riverine warfare also accounted for the large number of landing and machine guns. By 1930, the armament was augmented by 2 - 37 mm AA.

Careers

There is no record of their having taken part in any naval action. PARANA was sold in 1958 and ROSARIO in the following year.



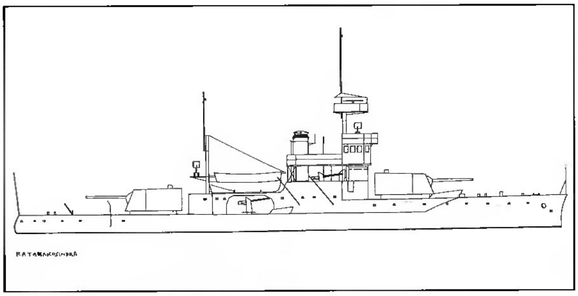
ROSARIO & PARANA as completed, 1909

RATANAKOSINDRA

Thailand

Yard & No	Laid down	Launched	Final trials	Designer
Elswick 872	1914			J R Perrett
High Walker 872a	29 Sep 1924	21 Apr 1925	10 Aug 1925	

Displacement	1000 tons. Originally 1 070 tons.
Dimensions	160 (175 oa) x 37 x 10 ft 9 in (originally 11) [48.77 (53.33) x 11.28 x 3.28].
Armament	2 x 6in 50 cal BL, 4 x 3 in AA. Originally 4 x 6 in BL, 4 x 3 in QF
Armour	Side 2½ in amidships. 1¼ in ends. Upper deck 1½ - ¾ in. Barbette rings 1½ in. CT 4 ¾ in. Decks: upper 1 in, ¾ in, ½ in, lower 1 in.
Machinery	2 sets VTE by Hawthorn Leslie. Designed IHP 850 = 12 knots. Trials 12.892 knots. Oil fired water tube boilers.
Fuel	Oil 85 tons. Originally coal : 15 tons normal, 50 tons maximum.
Complement	52



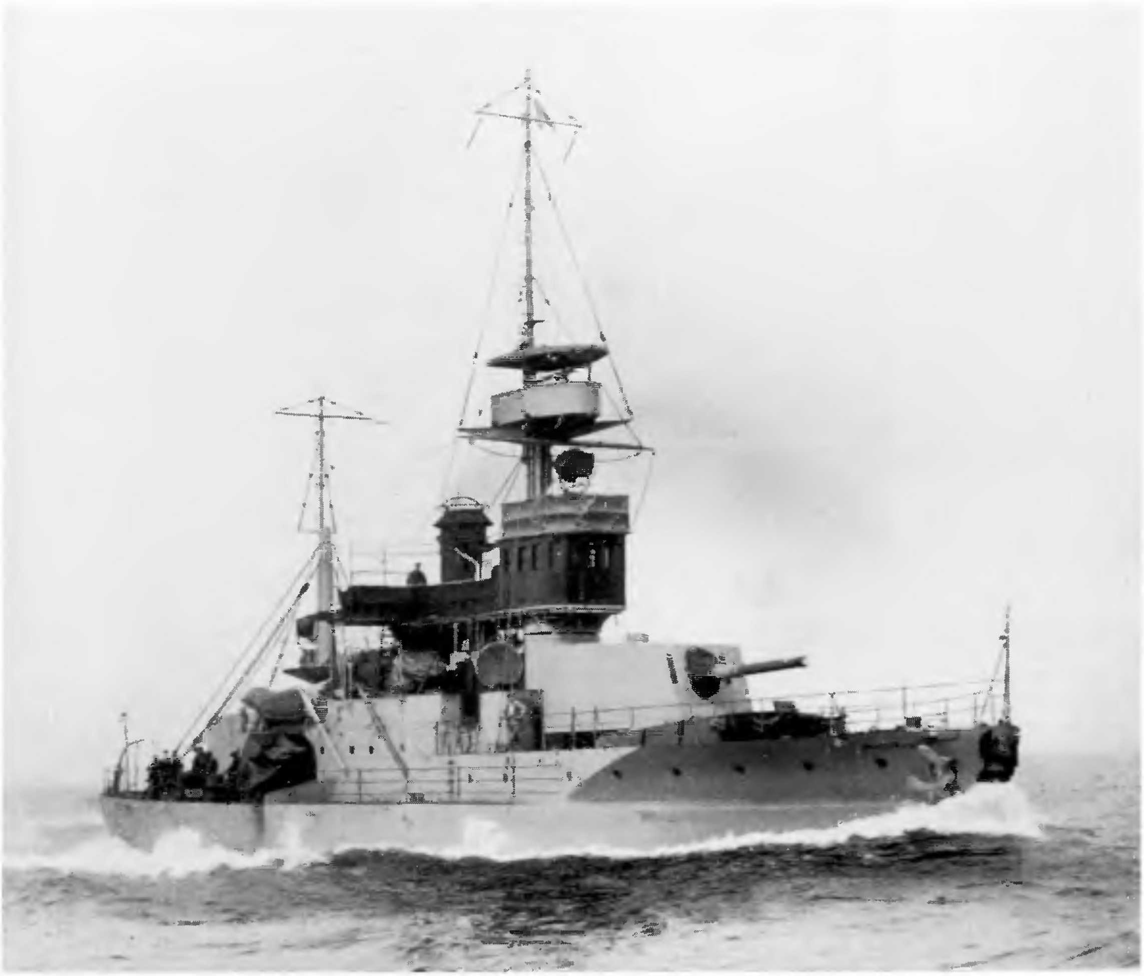
RATANAKOSINDRA 1925

General

RATANAKOSINDRA was ordered just before World War One, partially erected, but taken down during the war to free her slip. In 1924 she was re-ordered to a revised design with her main armament reduced from the original 4 x 6 in to 2 x 6 in mounted in single gun houses. Instead of coal fired cylindrical boilers she had oil fired 3 drum water tube boilers and at normal draft carried considerably more fuel. Her engine cylinders were originally 10½ x 18 x 30 in, stroke 22 in but in the final design the cylinders were 12 x 18 x 32 in, stroke 22 in, but with no change in IHP or speed. She had an almost identical sister, SUKOTHAI which was completed in 1929 by Vickers. She was called by the poetic name of Bangkok, equivalent to "the city of the angels".

Career

She left the Tyne for Siam on 31 August 1925 under a steaming crew but almost immediately was involved in a collision and finally departed 29 October. RATANAKOSINDRA did not see any active service and did not take part in hostilities between Siam and France in January 1941. Deleted 1968.



RATANAKOSINDRA on trials, 1923 Photo : The Shipbuilder

CHAPTER 3
PROTECTED CRUISERS

THE DEVELOPMENT OF THE EARLY CRUISERS

In the 1860's the Royal Navy was still building fully rigged, single screw, wood, composite or iron cruisers of the frigate or corvette type, slow steaming, having poor coal capacity and indifferent performers under sail. In the next decade the Royal Navy laid down speedier ships now designated "swift unarmoured cruisers" spurred on by the French Navy's policy of commerce destruction. They displaced 3,000 - 6,000 tons, were capable of 15 to 17 knots, and had to be fully rigged because of their small steaming radius. In the 1870's a number of technical changes came about that made the fast, well armed and protected but unrigged cruiser possible. Mild steel of consistent quality and suitable for shipbuilding was being produced at an economical price by the Siemens process; it was 25% to 30% stronger than the best iron thus reducing hull weight by 12% so that more coal could be carried. The introduction of the compound engine, lighter and more economical than the simple type*, also gave increased radius, further reducing the need for sail. William Froude's work with his experimental tank at Torquay, continued after his death by his son Edmund, meant that more efficient hull forms could be designed.

The first RN warships to be built using all these innovations were IRIS and MERCURY, launched in 1877 and 1878 respectively. They were of all steel construction, fast with a speed of 18 knots and lightly rigged, but unprotected apart from coal bunkers at the side of the boiler and engine rooms. However, there were different opinions in the Admiralty as to their function so that they were seen variously as trade protection vessels, armed despatch vessels or commerce destroyers.

Their successors, the COMUS class, were throwbacks in that, although steel-built, they reverted to a heavy rig, a single screw and a speed of only 13 to 14 knots. They did however introduce the protective deck to the cruiser type, in this class flat and covering the machinery only.

The next type was the LEANDER class, ante-dating ESMERALDA by almost a year. However, although in many ways comparable to ESMERALDA and carrying a more suitable cruiser armament, this class still had a partial steel deck covering the machinery spaces only. This deck was sloped at the sides to give more effective protection. Their successors, the MERSEY class, built a year after ESMERALDA, introduced the full length protected deck into the Royal Navy's cruiser classes. The MERSEYs were the first of this type to abandon sail rig.

Protection

Armoured decks, at or just below the water line covering machinery and magazines, offered good protection to the under water hull, gave as good resistance to shot and shell as a much thicker belt and gave protection to the ships' vitals from injury by fragments of shell bursting above the deck. If the deck were partial only, then the thin vertical bulkheads at each end were vulnerable to raking fire, so that the full length deck offered much better resistance. Giving the deck a strongly arched form gave protection to a much greater vertical area than a flat deck. J H Biles, in an important paper given to the Institution of Naval Architects in 1887, calculated that a 4.7in armoured deck, sloped 28∫, offered as much resistance as a 10in belt, and weighed much less.

Cruisers built with a full length protective deck but no belt were classified as protected. The hey-day of the type lasted from the mid 80s to the mid 90s, when improved steel alloys, face hardened by the Harvey, and later the Krupp, process allowed side armour to be spread over relatively large areas leading to the reintroduction of the armoured cruiser. The small protected cruiser was replaced by the unprotected, or very lightly protected, "SCOUT" type which itself developed into the light cruiser with thin vertical armour.

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* Compound engines used 1.3lb coal per IHP compared with the simple engines' 3.5 lb per IHP

ARMSTRONG CRUISERS

Armstrong's first protected cruisers were the logical development of the Rendel gunboat. George Rendel sought to design a ship which would have the gunboat's qualities of heavy guns, small target and cheapness but would be more seaworthy and have a longer range. The first design, in 1879, was a vessel of 1350 tons carrying an armament of 2 x 10 in and 4 x 4.7 in at a speed of 16.5 knots. This type was followed by ESMERALDA of 2950 tons with her two 10 in BL mounted 15 ft above water, a speed of 18.2 knots and with her vitals protected by a 1 in arched deck. A long line of export cruisers followed, usually carrying a heavier armament on a smaller hull at higher speed than contemporary Royal Navy vessels but which in later years they came increasingly to resemble.

Armament

The original Armstrong protected cruisers were envisaged as potential battleship destroyers, mounting a heavy breech-loading gun at each end. By using their superior speed they would in theory, but unlikely in practice, be able to choose the most appropriate range, or to disengage. PIEMONTE was the first major warship to have an all quick firing armament, of 6in and 4.7in guns, and this became the standard for most protected cruisers, but a number of Armstrong vessels still mounted an 8in gun at each end. These guns, although comparatively rapid firing, able in ideal circumstances to fire a 210 lb round every 15 seconds for a limited period, were too large for small vessels. Most of the early Armstrong cruisers were over-gunned and many had their armament reduced in later years. In one important part of the gun, that is the breech block, Armstrongs were outclassed by Vickers. The latter used the Welin stepped breech, while Armstrong's used the coned type, which had to be much heavier in order to give equal efficiency.

Performance

Armstrong cruisers were noted for their speed as well as their gun power. Was this reputation justified?. There is no doubt that Elswick cruisers were more lightly built than their RN counterparts. This is demonstrated by comparing the scantlings of the second ESMERALDA with her 11,000 ton contemporary, HMS DIADEM which was only one foot longer.

		ESMERALDA	DIADEM
Transverse bulkheads:	Above protective deck	7½ lb	10 lb
	Below protective deck	10 lb	12½ lb
Deck beams	Upper	18½ lb	24 lb
	Main	16 lb	24 lb
	Middle	13 lb	24 lb

(One square foot of steel 1 in thick weighed 40.8 lb)

That lightness did not necessarily imply structural weakness was shown by the YOSHINO suffering no permanent damage after her stranding during the Sino-Japanese War.

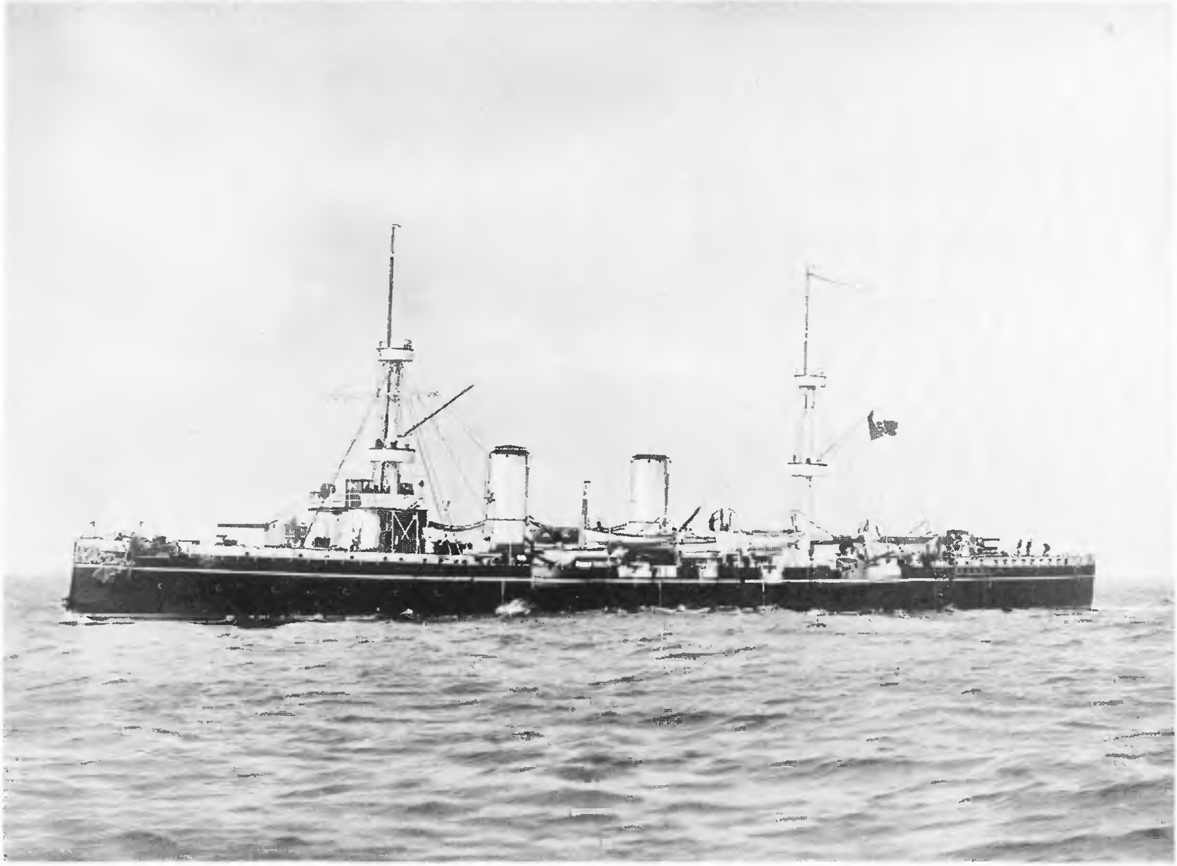
Armstrong cruisers carried less ammunition at normal displacement than their RN counterparts. For example, SIRIUS carried 250 rounds for each of her 6in and 4.7in quick firers, compared with PIEMONTE's 100 rounds for each gun.

They carried smaller amounts of coal at designed draft than Royal Navy ships so that at full load there was a greater immersion, with consequent loss of speed and reduction of freeboard. Much weight was saved by their having only shield protection for the guns, instead of the armoured casemates used in the larger RN protected cruisers. Elswick cruisers had a high length/beam ratio but this could mean less stability. Armstrongs were prepared to use engineering advances early. For example, Phillip Watts introduced for cruiser use the four cylinder vertical triple expansion engine, which although heavier, was better balanced and smoother running than the three cylinder type. The quick running engines developed low powers more economically than slow running machinery. Another example of innovation was the introduction of Yarrow boilers in DOM CARLOS I, this being the second cruiser (after the Austro-Hungarian ZENTA) to mount an all-Yarrow installation. Compared with cylindrical boilers the Yarrow type weighed less, were more economical, could be forced with less risk of damage, contained much less water, steam could be raised more quickly and they occupied less space.

In building for the export market and particularly when laying down stock vessels on speculation, Armstrongs designers could carry out their own ideas, unhindered by the need to try to meet the demands of conflicting branches of a naval staff. Most of their designs would not have suited the Royal Navy, with its overriding concern in its cruisers for seakeeping and range. Armstrong cruisers, with their heavy armament and high guaranteed trial speeds, looked attractive on paper and indeed were so to overseas navies where capability in all weathers and long range were not required. That the firm was equally able to build ships to Admiralty specifications is shown by the number of cruisers and other vessels that they built and which gave every satisfaction in service.

Weights

Table 3/1 shows the weight in tons and the percentage of normal displacements, devoted to the hull and fittings, equipment, armament, machinery and coal of a number of protected cruisers which are looked at in the following pages. Figures for four RN cruisers, three of which were built by Armstrongs are included for comparison.



PIEMONTE as completed, c.1890. Though this picture appeared in Janes Fighting Ships for 1902, it clearly shows the ship still carrying her original 6 x 6in guns, and dates from before 1891.

Photo: Vickers archive CUL

TABLE 3/1
WEIGHTS IN TONS (AND PERCENTAGES OF NORMAL DISPLACEMENT) OF PROTECTED CRUISERS

Ship	Hull & Fittings	Equipment	Armament	Machinery	Coal	Margin	TOTAL
ESMERALDA	1300	216	266	674	400		2856
	(45.52)	(7.56)	(9.31)	(23.6)	(14.01)		
BAUSAN	1467	215	320	680	400		3082
	(47.6)	(6.98)	(10.38)	(22.06)	(12.90)		
NANIWA	1603	239	409	698.5	350		3299.5
	(48.97)	(7.24)	(12.4)	(21.17)	(10.61)		
DOGALI	1005.2	136	143	608.5	160		2052.7
	(48.97)	(6.63)	(6.97)	(29.64)	7.79)		
CHING YUAN	1275.8	136	209.2	500	200		2321
	(54.97)	(5.86)	(9.01)	(21.54)	(8.62)		
ISLA DE CUBA	535.63	126.6	99	192	100		1053.2
	(50.86)	(12.02)	(9.4)	(18.23)	(9.74)		
ELISABETA	779.2	130	90.5	250	80		1329.7
	(58.6)	(9.77)	(6.81)	(18.8)	(6.01)		
PIEMONTE	1292	175	258	672	200		2597
	(49.75)	(6.74)	(9.93)	(25.88)	(7.7)		
25 DE MAYO	1751.5	76.5	234	850	300		3312
	(52.88)	(5.33)	(7.07)	(25.66)	(9.06)		
9 DE JULIO	1857.3	207	254	918	350		3586.3
	(51.79)	(5.77)	(7.08)	(25.6)	(9.76)		
YOSHINO	2180	271	269	1110	350		4180
	(52.15)	(6.48)	(6.44)	(26.56)	(8.37)		
BLANCO ENCALADA	2623.8	298.5	429	866	350		4567.3
	(57.43)	(6.54)	(9.39)	(18.96)	(7.66)		
BUENOS AIRES	2696	264	375	1108	300		4743
	(56.84)	(5.57)	(7.91)	(23.36)	(6.33)		
MINISTRO ZENTENO	1970	180	310	578	400		3438
	(57.3)	(5.24)	(9.02)	(16.81)	(11.63)		
TAKASAGO	2251	275	316	1110	350		4302
	(52.32)	(6.39)	(7.35)	(25.8)	(8.14)		
DOM CARLOS I	2385	260	280	665	700		4300
	(55.47)	(6.05)	(6.51)	(15.47)	(16.28)		
KATOOMBA	1234.2	250	175	549	300		2508.2
	(49.2)	(10.0)	(7.0)	(21.9)	(11.9)		
SIRIUS	1806.8	273	194	730	400		3404.5
	(53.1)	(8.02)	(5.7)	(21.45)	(11.75)		
PACTOLUS	1110	200	137	360	250	78	2135
	(52.0)	(9.37)	(6.42)	(16.86)	(11.71)	(3.65)	
TALBOT	3140	420	360	906	550	224	5600
	(56.67)	(7.5)	(6.43)	(16.18)	(9.82)	(4.0)	

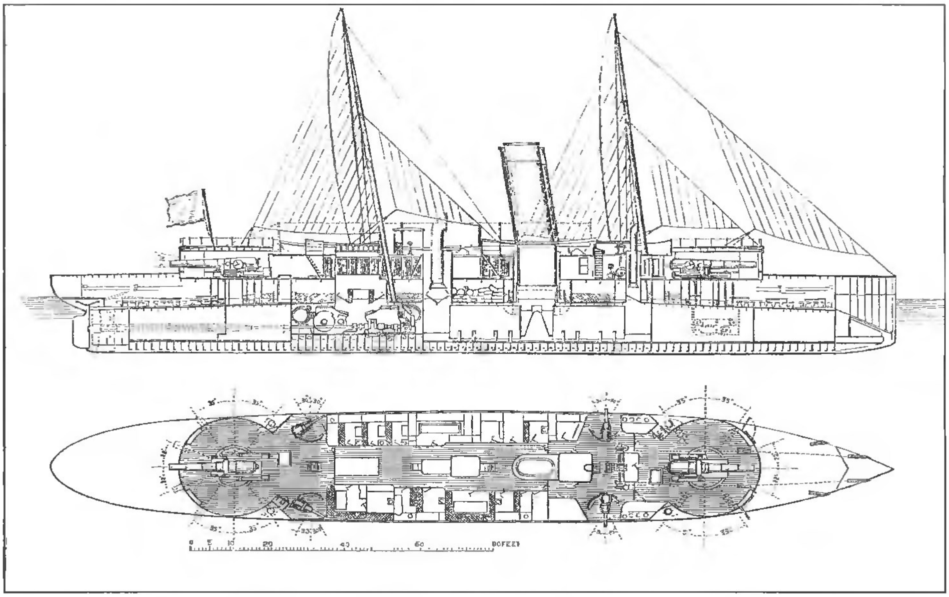
Source: Thurston Green Notebooks, NMM.

TSUKUSHI
ex ARTURO PRAT
Japan (ex Chilean)

CHA'O YUNG YANG WEI
China

Yard & No	Laid down	Launched	Completed	Designer
TSUKUSHI				
Low Walker 399	2 Oct 1879	11 Aug 1880	11 Nov 1880	George Rendel
CHA'O YUNG				
Low Walker 406	15 Jan 1880	4 Nov 1880	15 Jul 1881	George Rendel
YANG WEI				
Low Walker 407	15 Jan 1880	29 Jan 1881	14 Jul 1881	George Rendel

Displacement	1350 tons.
Dimensions	210 x 32 x 15 [67 x 9.8 x 5.1]
Armament	2 x 10 in BL, 4 x 4.7 in BL (Albini mountings), 2 x 9 pdr field, 4 mg.
Armour	Full length curved steel under water deck, $\frac{3}{8}$ in thick: 1 ft below wl at centre line, 2 ft below wl at sides. CT $\frac{1}{2}$ in. Fixed gun turrets 1 in side, $\frac{3}{16}$ in roof.
Machinery	2 sets horizontal compound by R & W Hawthorn. Four cylindrical boilers. Trials (CHA'O YUNG) IHP ND 1912 = 14.3 knots. FD 2887 = 16.5 knots.
Fuel	Coal 250 tons normal, 300 tons maximum. Nominal endurance of 5380 miles at 8 knots.
Complement	177.



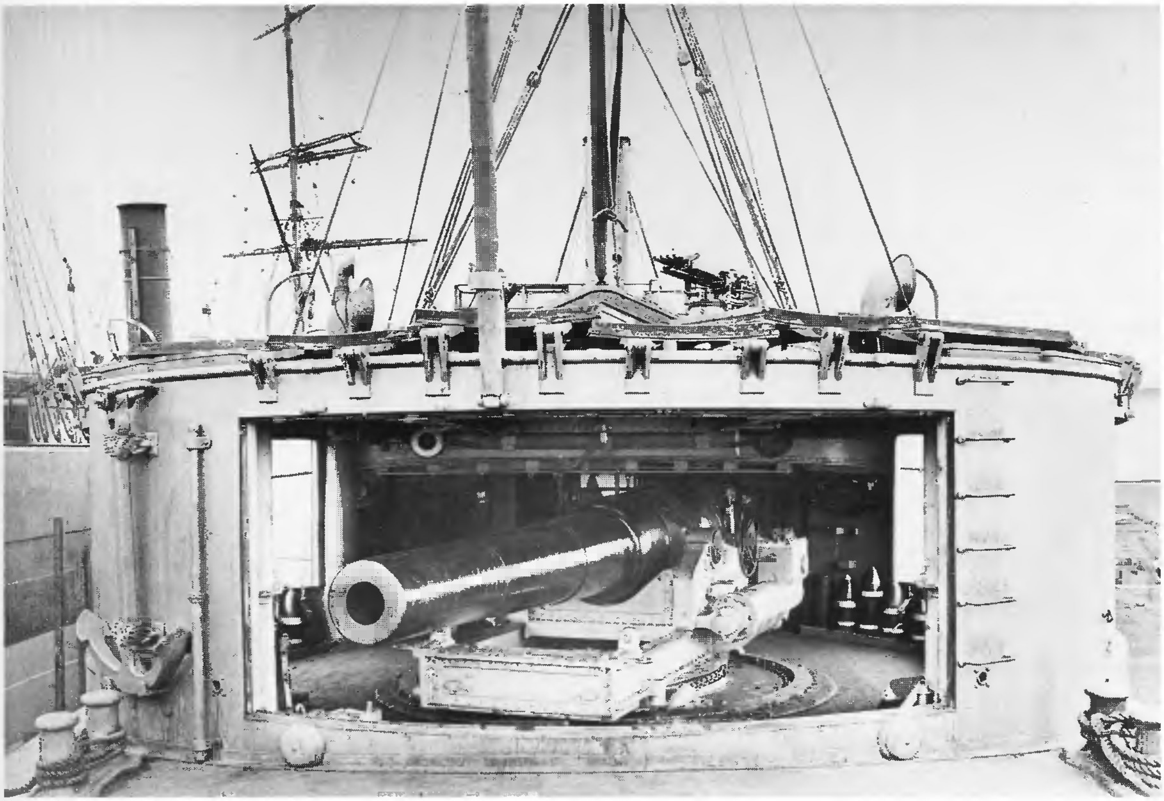
CHA'O YUNG and YANG WEI, from Brassey's British Navy

General

The idea of small, fast, unarmoured, heavily gunned ships was laid out in a "private and confidential" memorandum probably written by Stewart Rendel dating from the late 1870s. After putting forward reasons why side armour should be abandoned, the paper advocated placing engines and boilers below the waterline "with a light protective deck placed a little below the water line and preventing the entrance of water to the machinery". "The armament of such a ship is unprotected but being worked by hydraulic power it requires only very few men and is of a simple character little liable to injury".

"An unarmoured cruiser may be built on the above principles having the following approximate dimensions and qualities . Displacement 1200 - 1400 tons, draft 15 ft, speed 15 knots, 2 independent engines, twin screws". The memorandum went on to recommend that "the armament be two 25 ton Armstrong new type guns, breech or muzzle loading, commanding between them an all round fire independently of the vessel's motion besides four small but powerful guns, gatling guns, torpedo steam launches, etc". The bow would be strengthened for ramming, the cost would be £80 - 100,000 and the time to build 15 - 18 months.

The memorandum concluded that these ships were not seen as gunboats, "but as independent parts of a naval force and as having duties quite distinct from those of the gunboats. These larger vessels from their great speed and artillery power combined, would be able to follow up and search out ironclads and to choose their own mode and time of attack ..... five of the new vessels could be built for the cost of one such ironclad. Collectively, they would offer greater power than the ironclad".



The after 10in gun on YANG WEI, with the ports of the fixed turret open and laid back onto the turret roof. Note also the four-barrelled Nordenfelt on the roof. Photo : Vickers

The first of three ships built along these lines was laid down for Chile, followed by two for China. Their two main guns were, with the exception of the huge muzzle loaders of INFLEXIBLE and DUILIO, more powerful than any other gun afloat. For their size they were fast, and their high speed of 16 knots was achieved with the use, for the first time in a warship, of forced draught produced by a closed stokehold. Protection was given by a steel underwater deck, the openings in which either had water tight hatches or were surrounded by cofferdams 3 ft 6 in high. Between this deck and the gun deck there were stores and coal to provide further protection, and there were seven main transverse bulkheads; the engines and boilers had coal bunkers at their sides.

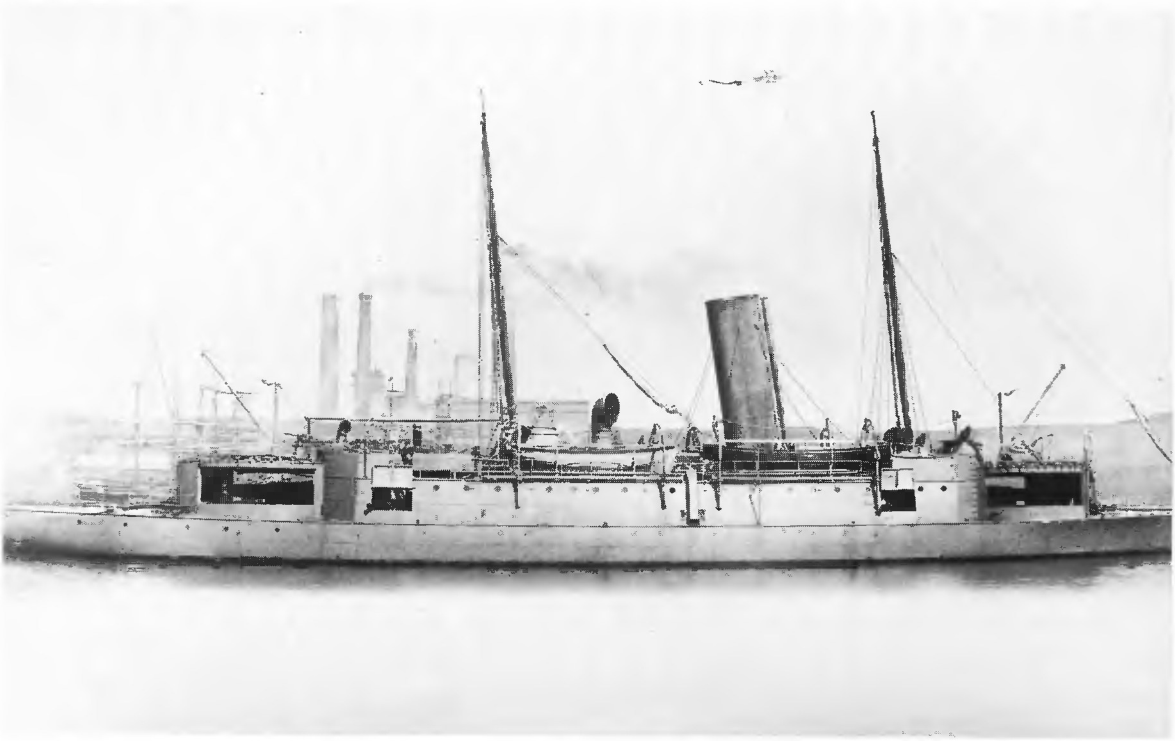
To attain so much on a limited displacement sacrifices had to be made, and their freeboard – 5 ft forward – was so limited that the TSUKUSHI was fitted with a temporary topgallant forecastle to improve her sea keeping qualities, thus depriving the forward big guns of any bow fire. The presence of a painted-over five pointed star in photographs suggests that this was originally fitted for the voyage to Chile, remaining in place until TSUKUSHI arrived in Japan when it was removed. Whether the Chinese pair were similarly fitted is not known, but the Admiralty learnt that on a voyage off the Chinese coast, one of the pair had her bows submerged 3 or 4 feet and both launches were damaged, one being broken in half. The Royal Navy's intelligence department commented that they were lightly built, and that, "the hull would certainly be riddled at close quarters by the machine guns". Her 16 knots could not be sustained for any length of time but was for use in emergencies or in action for a maximum of three hours. 15 knots could be maintained for five hours but would need the use of forced draught, so that her highest working speed was 13 knots only. However early in in service CHA'O YUNG travelled 172 miles at an average speed of 15 knots.

Another limitation to the three ships effectiveness was that their two heavy guns were mounted in a fixed turret which allowed relatively small angles of training, 22° either side of the midline, fore and aft, and 35° before and abaft the beam on each side. Loading and training were hydraulic but elevation was by hand. The guns had to be brought into the fore and aft position to be loaded, resulting in a low rate of fire. For cruisers the heavy armament was quite inappropriate.

The main guns fired a 400 pound shell; a battering charge of 180 pounds gave a muzzle velocity of 1837 feet per second. The full charge of 140 pounds gave a muzzle velocity of 1700 feet per second. The ammunition supply for the big guns was 34 common shells, 10 shrapnel, 36 chilled shells and 14 chilled shot with 6 case shot. 50 battering charges of 180 pounds and 50 service charges of 140 pounds were carried. The 40 pdrs were supplied with 12 common shell, 30 segmental, 30 shrapnel and 10 case shell.

Sir William Armstrong in his presidential address to the Institution of Civil Engineers in 1881 was predictably sanguine about their capabilities, calling for the Royal Navy to have numerous small, swift, unarmoured lightly built vessels. He quoted Edward Reed's view on the TSUKUSHI class; "there is not a single ship in the British Navy carrying an armament competent to deal with them that could overtake them in pursuit or evade their attack when prudence dictated a retreat".

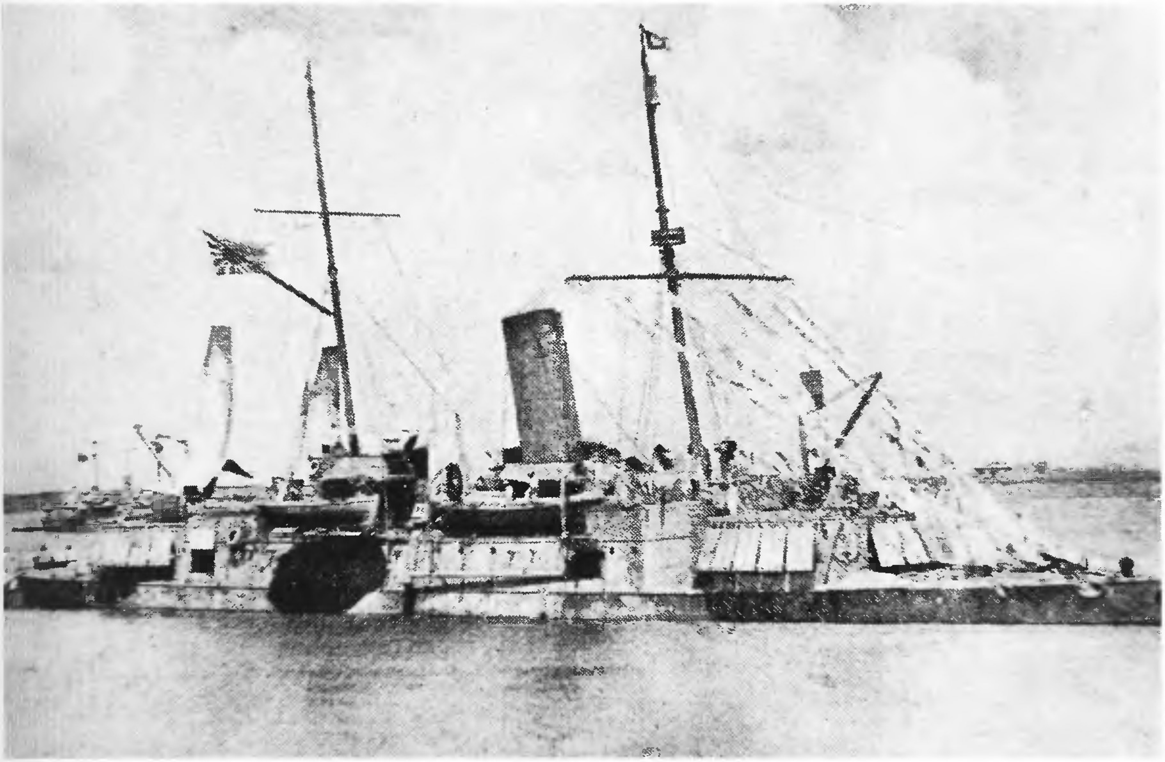
The "Times" (26 July 1881) gave an account of their steam and gun trials and commented favourably on their manoeuvrability as they could stop in 1½ lengths with the engines going astern and with one engine going forward, and the other astern, they could turn in their own length. The Times concluded that, while too much should not be claimed for them, "the penetrative power and range of their guns ...... exceed that of any afloat except those of the English INFLEXIBLE and the Italian DUILIO. No unarmoured ship that carried guns can be compared for a moment with them and no armoured ship equals them in speed ...... Thus their vastly superior gun power would make them most formidable to the largest unarmoured vessels, and their superior speed and greater range and power of their artillery would enable them to in some measure cope with an ironclad since they could ordinarily choose their own distance, and from their diminutiveness would be very hard to hit; nor would a single shot by any means disable them, owing to their under-water and other protection." The Times conclude that in the role of skirmishers or cavalry "they would prove valuable adjuncts to a first class navy."



YANG WEI in the Tyne before delivery, 1881, with gunports open and turret lids raised

Photo : Vickers

Career
TSUKUSHI
She was laid down for Chile as the ARTURO PRAT but because of the successful progress of the naval side of that country's war again Peru, Chile either arranged for her sale or lost title by ceasing payments; she was bought by the Japanese government on 16 June 1883, perhaps in response to her sister ships having been delivered to China. There is no record of her activities in the Sino-Japanese War of 1894-95 apart from her being a member of the Fourth Flying Squadron, not being in action at the Yalu but participating in the bloodless capture of Ta-Lien Bay to the east of Port Arthur. In the Russo-Japanese War TSUKUSHI played an important part in the capture of the Nanshan position by silencing Russian guns, then served for a time as guardship to Newchwang; at the Battle of Tsushima she was one of Rear Admiral Yamada's Seventh Division (Third Squadron) but, because the division was stationed in the western channel of the Tsushima straits, she took no active part in the battle. She was removed from the active list 25 May 1906, served as a training ship at Kure and was broken up in about 1910.



TSUKUSHI at Newchwang during the Russo-Japanese War, 1904

Photo from Wilson : Japan's Fight for Freedom

CHA'O YUNG and YANG WEI
Li Hung-Chang decided to supplement his northern fleet with vessels capable of taking the offensive. As with the Alphabeticals, James Campbell, Robert Hart's London agent, was given the responsibility for ordering and their supervision while building. The Chinese needed convincing that the big guns should be breech loaders. Stewart Rendel explained that the height of the turrets, the length of the guns, the presence of a ram at one end, and the rudder at the other, made muzzle loaders impractical. Their small size precluded their carrying a torpedo boat capable of carrying Whitehead torpedoes and there was also the risk of any torpedoes exploding through mismanagement; Rendel instead offered a launch equipped with a spar torpedo.

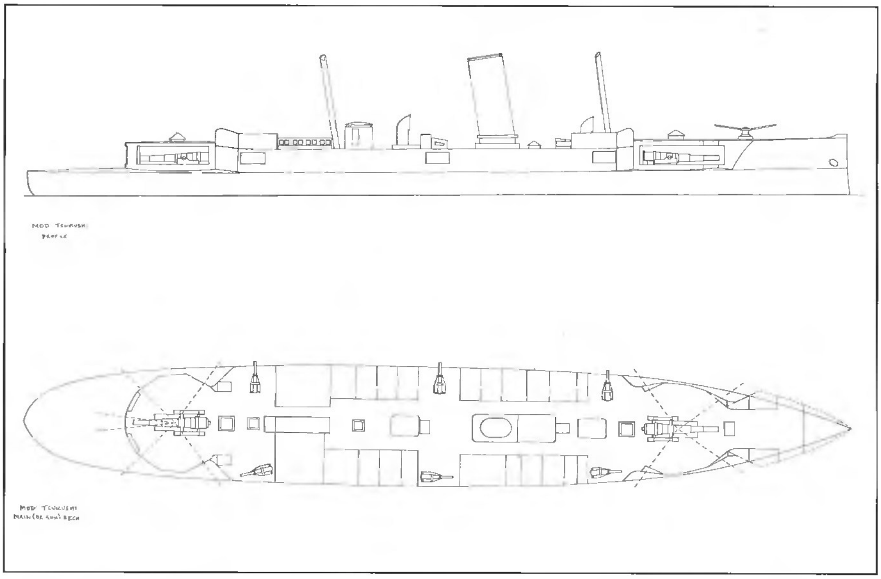
The pair left Newcastle for China on 9 August 1881 flying the Chinese flag, manned by a Chinese crew and commanded by Admiral Ting of the Chinese Navy. They reached their destination in mid October but not without incident, as the YANG WEI ran out of coal and drifted around the Mediterranean for two days, lost a propeller in the Suez Canal and ran aground in Canton river; the last two occurrences being the fault of the local pilots.

During their service with the Chinese Navy they were neglected so that their boilers were worn out, while the powder for the guns was 13 years old at the time of the Yalu and had been condemned. At the Battle of the Yalu, 17 September 1894, Admiral Ting chose to fight in line abreast and compounded this mistake by placing his weakest ships on the wings; so it was that CHA'O YUNG and YANG WEI found themselves in the vulnerable post of the extreme right of the fleet. The four fastest Japanese ships, YOSHINO, NANIWA, TAKACHIHO, and ITSUKUSHIMA (all, except the last, Armstrong built) forming the "Flying Squadron" crossed the Chinese line and attacked the right wing. They opened fire at a range of 3000 yards. Despite this the Chinese pair's big guns continued firing for a time but they were no longer effective and later in the day CHA'O YUNG sank, and the badly damaged YANG WEI was run aground with her upper deck completely burnt out. On the day after the battle, abandoned by her crew, she was destroyed by the Japanese.

Improved TSUKUSHIs

In February 1881 Armstrongs produced a blueprint for an enlarged, better armed and more seaworthy TSUKUSHI type. They carried an extra 4.7 in gun on each broadside and had a permanent topgallant forecastle so that the forward 10 in gun had no forward fire but had 20° more arc of firing on each broadside than TSUKUSHI. The after 10 in gun also had 90ʃ of training on each broadside but had an arc of training astern of only 7° each side of the centre line. Freeboard was 16 - 17 ft forward and 7 ft aft.

Dimensions were:- 230 pp x 37 beam [70.1 x 11.28] Depth to awning deck 21 ft 9 in [6.63].



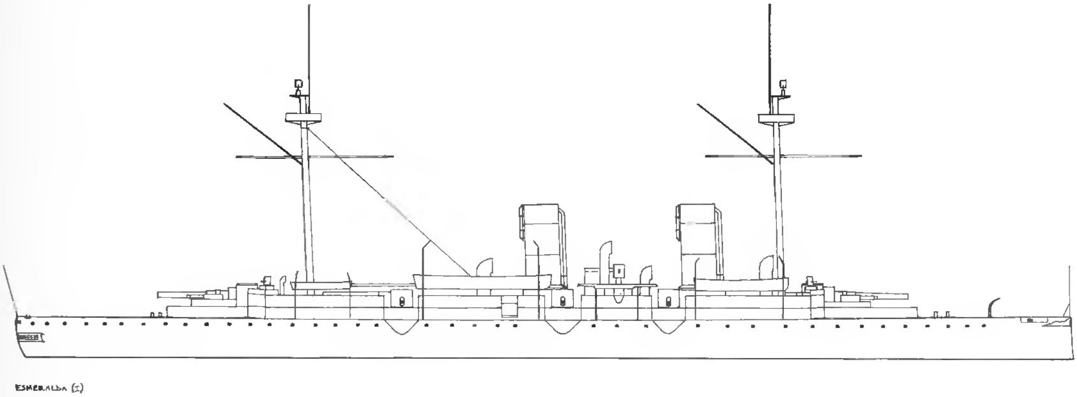
George Rendel's design for an improved TSUKUSHI, as redrawn by Ian Sturton.

ESMERALDA

Chile

Yard & No	Laid Down	Launched	Completed	Designer
Low Walker 429	5 Apr 1881	6 Jun 1883	15 Jul 1884	George Rendel

Displacement	2950 tons
Dimensions	270 x 42 x 18 ft 6 in [82.2 x 12.8 x 5.6]
Armament	2 x 10 in 30 cal BL, 6 x 6 in 26 cal BL, 2 x 6 pdr QF, 5 x 37 mm Hotchkiss revolving cannon, 4mg. Originally designed for one 14 in stern TT but not fitted.
Armour	Deck: complete underwater, 1 in-½ in; at centre line 1 ft below water line, 5 ft below water line at sides. Cork belt from 2 ft below to 3 ft above water line at sides. CT 1 in. Big gun loading stations 1½ in - 2 in.
Machinery	2 sets horizontal compound by R & W Hawthorn. 4 double-ended boilers. Trials IHP FD 6083 = 18.29 knots.
Fuel	Coal. 400 tons normal, 600 tons maximum. Nominal endurance 6000 miles at 10 knots.
Complement	296.



ESMERALDA 1884

General

ESMERALDA may be seen as the logical development of the TSUKUSHI class. Like them she carried steadying sails only, mounted a powerful main armament, and was steel built. But, unlike her immediate predecessors, ESMERALDA was a seagoing warship with a 2 knot advantage in speed, five feet more freeboard, a more powerful secondary armament and a greatly extended radius of action. She was the first modern protected cruiser.

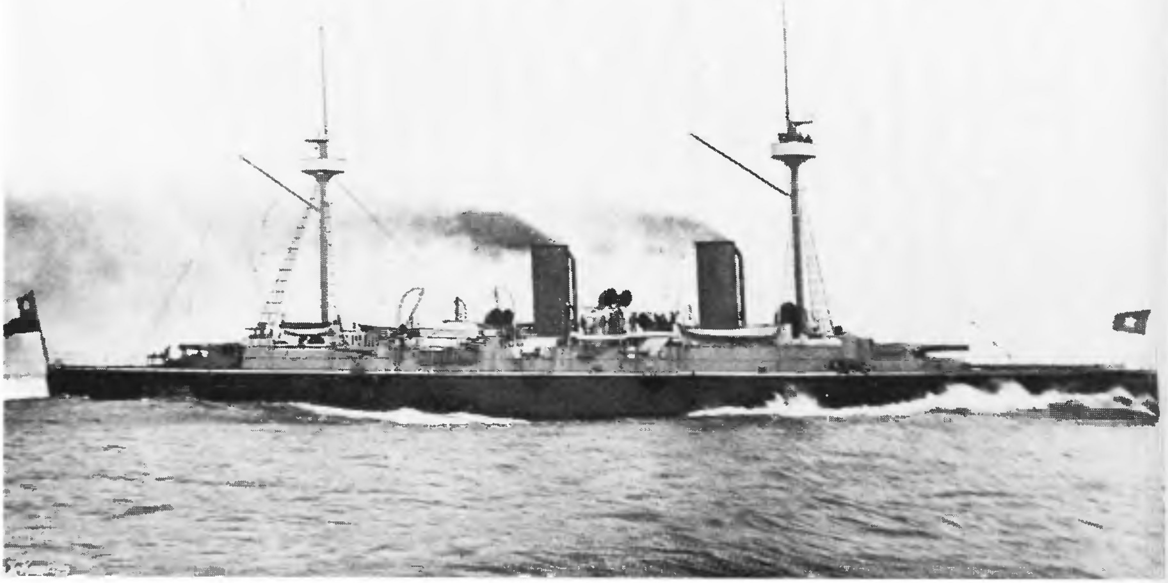
She attracted much attention, the Prince of Wales visiting her and The Times printed a lengthy article at the time of her speed trials written anonymously by W H White, Armstrong's chief naval architect. ESMERALDA helped inspire the design of the Royal Navy's first protected cruisers proper, the MERSEY class, which White had designed shortly before leaving the Admiralty to join Armstrongs. Fifteen years later Sir Nathaniel Barnaby, White's predecessor as DNC, wrote that cruisers of this type "did two notable things ... they made the fortune of the Armstrong firm, for the ESMERALDA type, sometimes with a narrow strip of side armour but more often than none, is now (ca 1899) in high favour of all navies. Secondly, they had led to the increase in speed of all ships of war and to the abandonment of sail power".

The protective deck ran the full length of the ship and was arched. It was 1 in thick over the engines and boilers, and ½ in thick fore and aft. At its forward end it reinforced the ram. Further protection was given by coal bunkers at the sides and coal stowed in the five foot space between the protective and lower (berth) decks. There was also a cork belt along the waterline, supposedly to limit water coming in if the side were holed, but in practice it had no value. Because the armour deck was below the waterline, it could not guarantee buoyancy, stability or trim when the sides of the vessel were perforated, but it could prevent shell fragments damaging boilers or machinery or getting through to the magazines.

All main and secondary guns were carried on the upper deck and were 15-16 feet above the water. Sixty feet from the bow and stern there was a 25 ton, 10 in breech loading gun firing a 450 lb projectile with a 230 lb powder charge. These two heavy guns were mounted on central pivot carriages, with hydraulic mechanism for training the gun and running it in and out on its slide. At the rear of the slide was a small steel screen, 1½ in thick, revolving with the gun which contained the handles of the hydraulic mechanism and the gear for elevating (maximum 12°) and depressing (maximum 5°) the gun, and which formed the protected station of the gun captain and two gunners. There was a fixed loading position protected by 2 in plate, manned by three men; for loading, the guns were laid fore and aft, then ran back along their slides, so that the breech of each gun was brought within the shelter of the fixed steel screen which contained the hydraulic rammer; from its floor ran a steel tube down to the magazines and shell rooms; shells were raised hydraulically and the charges by a hand winch. Loading must have been a slow process. The 6 in, 4 ton, breech loading guns were disposed three on each broadside on Vavasseur central pivot mountings. In addition there was a 6 pdr quick firing gun at the end of each bridge wing, while the Gardner and Hotchkiss machine guns were mounted in the military tops and along the bulwarks. The horizontal compound engines were in separate compartments and the four cylindrical boilers in two compartments. One curious reversion to past usage was the painted false stern windows.

On such a small displacement certain qualities had to be sacrificed, so that at normal load, freeboard was 10 feet 9 in only, and there was no double bottom.

The Admiralty were highly critical of her design, comparing her unfavourably with the Royal Navy's first protected cruisers of the MERSEY class. The steering engines were only just below the waterline and were not protected by the deck. The coal bunkers were not subdivided by water tight bulkheads, as in the MERSEY, and, because the trimming holes had no doors, and had their bottoms level with the waterline, a shot between wind and water would flood large areas, while the cork belt would be rapidly destroyed as it was shallow. To accommodate the boilers between her bottom and her armoured deck, the tubes were above the furnaces which made them more vulnerable to shell fire and there was not enough space for a double bottom. There was no conning tower proper, merely a rifle-proof structure weighing 6 tons, as compared with the MERSEY's 50 ton conning tower, and there was no emergency steering position. The accommodation for the officers was excellent and was good for a crew of 200 men. Her final complement of nearly 300 would have been in crowded quarters.



ESMERALDA running trials off the Tyne, summer 1884, already under the Chilean flag. She has yet to ship searchlights on the small platforms at her lower mastheads. Photo : NAI

The DNC's department produced a comparison in weights and percentages between ESMERALDA and MERSEY. For the latter they allowed 500 tons of coal but in service she carried a full load of 900 tons and percentages have been adjusted accordingly in the third column. ESMERALDA is, in MERSEYs ships cover, given with a full complement of coal. The figures bring out the much greater weight devoted to protection in MERSEY, not only the thicker deck, but 50 tons for the CT, compared with ESMERALDA's 6 tons; less weight proportionally was given to machinery. MERSEY's greater displacement allowed for a raised forecastle and poop making her a better sea boat.

	ESMERALDA 3050 tons full 2 x 10 in, 6 x 6 in		**MERSEY** 3605 tons as designed 2 x 8 in, 10 x 6 in		4005 tons full	
	Percentage	Tons	Percentage	Tons	Percentage	Tons
Equipment	5.7	174	7.62	275	6.87	275
Armament	7.64	233	7.49	270	6.74	270
Machinery	20.82	635	15.81	570	14.23	570
Coal	19.67	600	13.86	500	22.47	900
Armour	3.54	108	13.86	500	12.48	500
Hull	42.63	1300	41.36	1490	37.45	1490

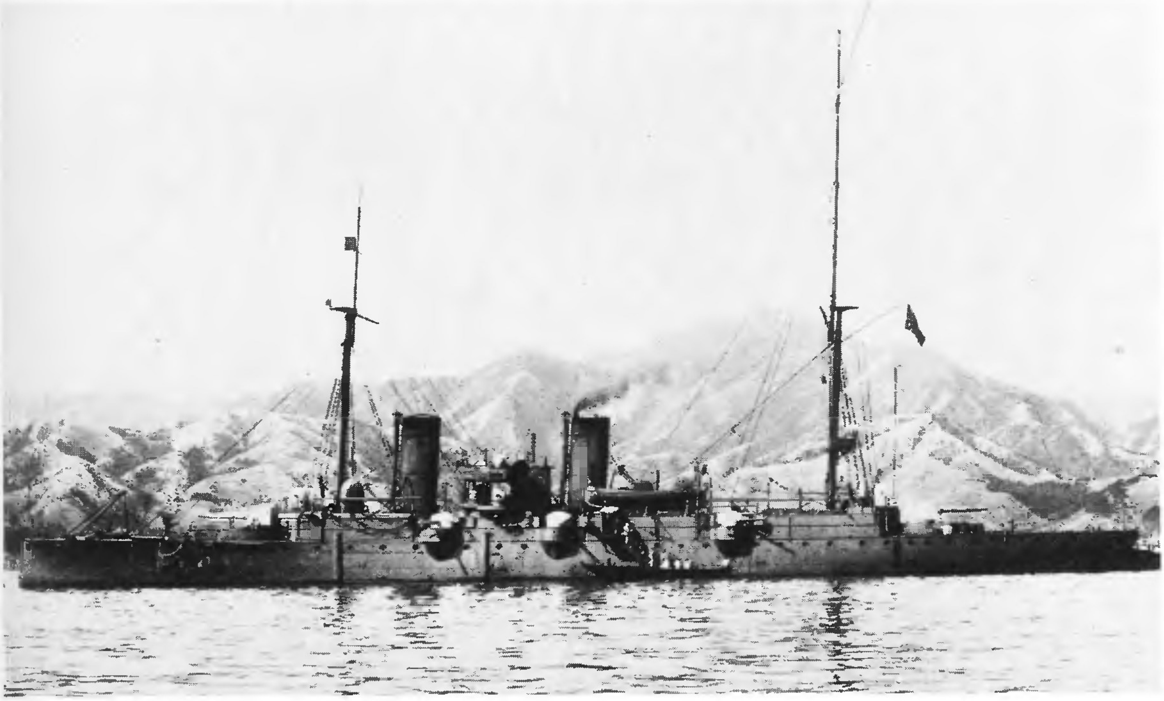
While ESMERALDA was still building, the Japanese government asked Sir Andrew Noble of Armstrongs to obtain authorisation from the Chilean government to sell her. The Chileans agreed, but only on condition that a replacement vessel would be 10 feet longer. Armstrongs accepted this but stipulated that the Chileans allow the speed premium to start at 16 knots; this proved unacceptable and the sale fell through.

Career

ESMERALDA took an important role in the Chilean Civil War of 1891 being a major element in the navy-dominated Congressional (rebel) forces. In February she bombarded Iquique. In the final battle of the war in August she bombarded the government (Balmacedist) troops with her heavy guns and produced much demoralisation in their ranks though with little loss of life.

In March 1894 the Elswick yard was asked to tender for a refit which was to include modern engines and boilers, teak sheathing, the addition of a poop and forecastle and a modern armament. The refit never materialised, as in November 1894 in the course of the Sino-Japanese War she was sold to the Japanese, with the government of Ecuador acting as an intermediary, the handover taking place in the Galapagos Islands. When the transaction became public knowledge in Ecuador it was so unpopular that the government of President Cordero was overthrown by an armed insurrection.

ESMERALDA was renamed IZUMI; she took no part in the Sino-Japanese war. Her old 6 in guns were replaced by 4.7 in QF in 1899 and being regarded as a bad sea boat the fighting tops were removed; 6 in QF then replaced the 10 in guns in 1901.



IZUMI, rearmed, with her fighting tops and masthead searchlights removed, and with a tall w/t gaff at her mainmasthead, during the Russo-Japanese War, 1904-5 Photo : Fukui Shizuo

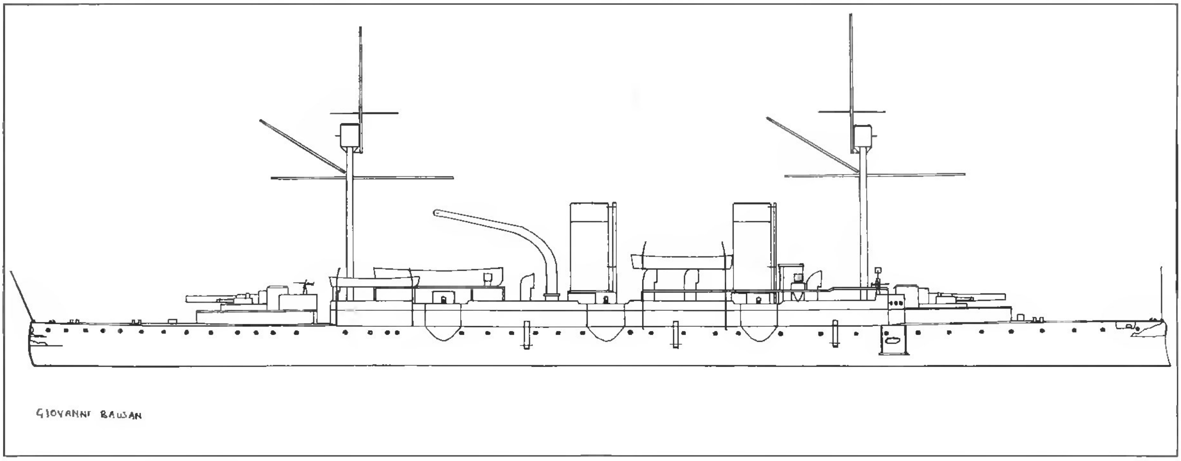
She took an active part in the Russo-Japanese war being one of the Sixth Division of the Third Squadron. Her career culminated at the decisive battle of Tsushima 27-28 May 1905. She formed part of the screening line, was one of the first ships to sight the Russian fleet, and for some hours shadowed the Russians from a station five miles to starboard of the flagship KNIAZ SUVOROV, regularly reporting her movements by wireless. A few shots were exchanged with the Russian cruisers but no real attempt was made to drive her off for several hours, when after rendering an invaluable shadowing function, she eventually left her isolated position to join the rest of the Sixth Division which had come to her assistance. After the war she was reduced to subsidiary duties and was stricken from the Navy List 1st April 1912.

GIOVANNI BAUSAN

Italy

Yard & No	Laid down	Launched	Completed	Designer
Low Walker 453	21 Aug 1882	15 Dec 1883	9 May 1885	George Rendel

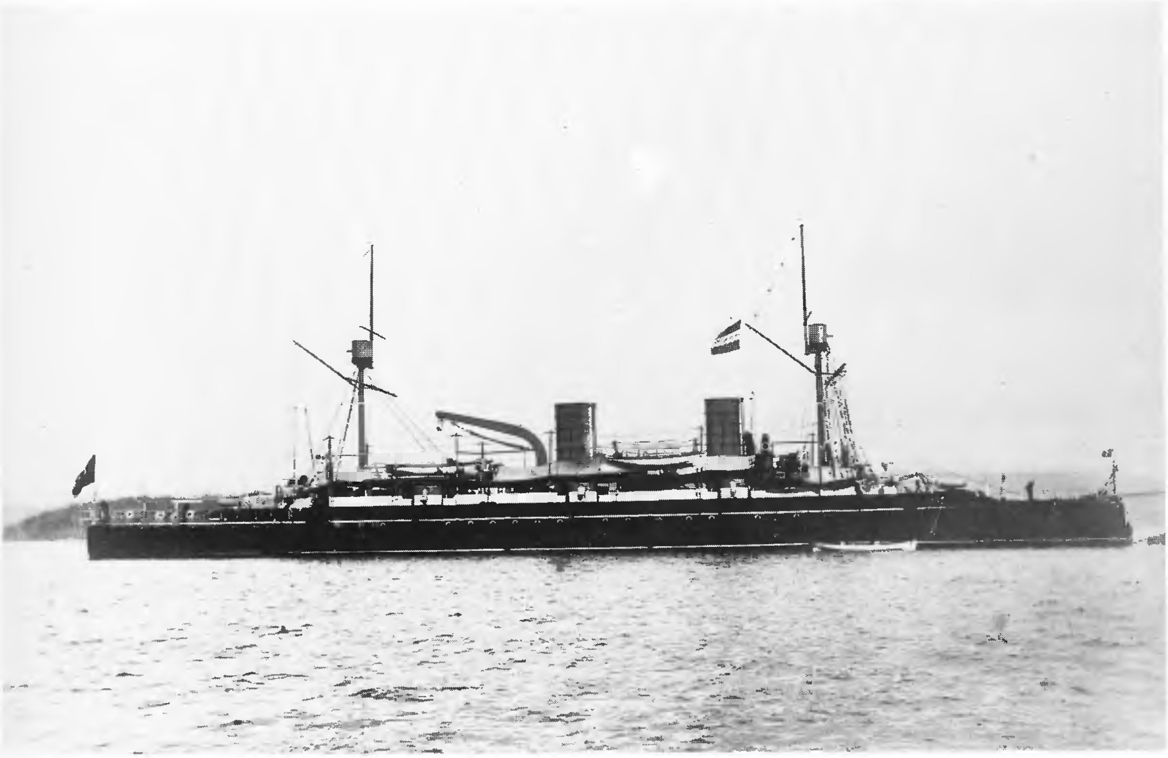
Displacement	3082 tons.
Dimensions	280 x 42 x 18 ft 6 in (84.6 x 12.8 x 5.6)
Armament	2 x 10 in 30 cal BL, 6 x 5.9 in (149 mm) 26 cal BL, Albini mountings, 4 x 6 pdrs, 2 x 1 pdr QF, 4 mg, 3 x 14 in TT. 1 bow submerged, 2 broadside aw.
Armour	Deck 1½ in. 2 in shield at breech of 10 in guns.
Machinery	2 sets horizontal compound by R & W Hawthorn. 4 double-ended cylindrical boilers. Trials IHP FD 6470 = 17.4 knots.
Fuel	Coal. 400 tons normal. 600 tons maximum. Nominal endurance of 5000 miles at 10 knots.
Complement	13/254.



GIOVANNI BAUSAN, 1885

General

BAUSAN was Italy's first modern cruiser, rated as 'Ariete Torpediniere' or torpedo ram. She was slightly larger than ESMERALDA (ten feet longer), carried two extra 6 pdr QF and mounted 3 TTs. One feature which distinguished her from her near sisters, ETNA, VESUVIO, STROMBOLI and ETTORE FIERAMOSCA (built in Italy from Armstrong plans), was a goose-necked boat handling crane aft of her second funnel. Another distinguishing feature was the shape of her tops. With additions, for example to her bridge, she sank lower in the water as she got older. In 1899 the 5.9 in BL were replaced with 6 in 40 cal QF, two of which were removed by 1904. In 1915 her 10 in guns and two more of the 6 in had been removed. She was completely disarmed in July 1916.



GIOVANNI BAUSAN during her first years in service, c.1888 Photo : Author's collection

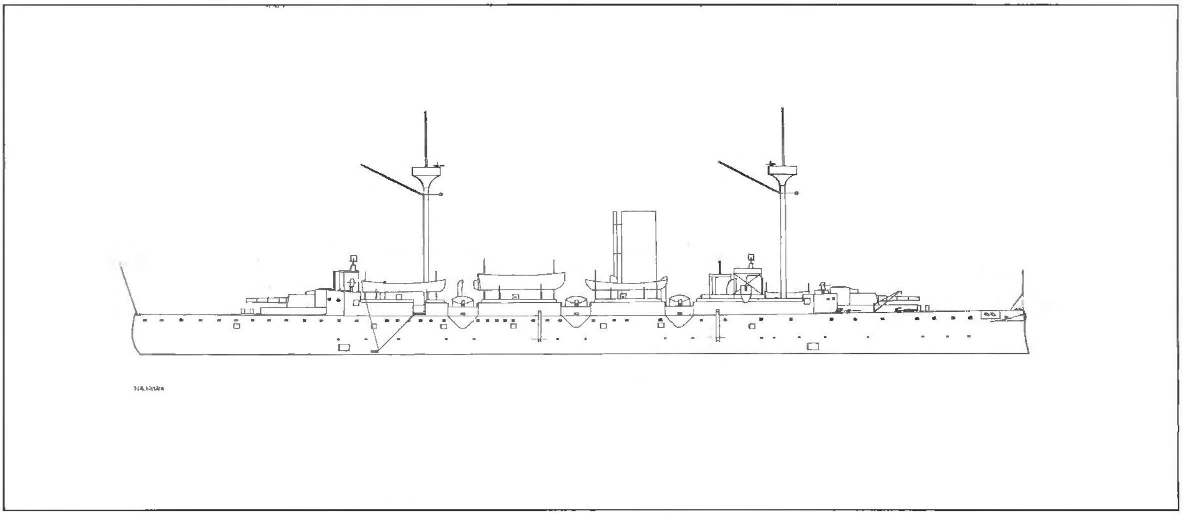
Career

GIOVANNI BAUSAN left the Tyne under Italian command on 21 May 1885 to become part of the Squadra Permanente, the operational sea going squadron of the Royal Italian Navy. In 1887 and 1888 she took part in the conquest of Eritrea, for much of the time flying the flag of the flag officer commanding naval forces in the Red Sea. Subsequently she spent much time overseas, particularly off North and Central America. From 1905 to June 1912 she was employed as a training ship for stokers and engineer ratings. During the Italo-Turkish war of 1912 she served from 19 June as flagship Cyrenaica and with four torpedo boats patrolled and carried out fire support duties and was then used as a distilling ship. In World War I she was a depot ship for seaplanes at Brindisi. Paid off in 1919 she was sold for scrapping in March 1920.

NANIWA TAKACHIHO
Japan

Yard & No	Laid down	Launched	Completed	Designer
NANIWA Low Walker 475	27 Mar 1884	18 Mar 1885	1 Dec 1885	W H White
TAKACHIHO Low Walker 476	10 Apr 1884	18 Mar 1885	26 Mar 1886	W H White

Displacement	3727 Tons
Dimensions	300 (320 oa) x 46 x 18 ft 6 in (20 ft 3 in full load) [91.4 (97.5 oa) x 14 x 5.6]
Armament	2 x 10.2 in (26 cm) 32 cal Krupp BL (606 lb shell, 192 lb charge. mv 1805 ft/secs), 6 x 5.9 in (150 mm) 35 cal Krupp BL (112 lb shell, 38 lb charge, mv 1805 ft/secs), 2 x 6 pdr QF, 10 x 1 in Nordenfelt. 4 Gatling mg. 4 x14 in TT aw.
Armour	Deck 3 in slopes, 2 in flats. CT 3 in. Loading stations to big guns 2 in.
Machinery	2 sets horizontal compound engines by R & W Hawthorn, 6 cylindrical boilers. Trials IHP FD 7120=18.77 knots. Speed trial of TAKACHIHO in Japan FD=17.88 kts
Fuel	Coal. 350 tons normal. 800 tons maximum.
Complement (1904)	NANIWA 338. TAKACHIHO 342.

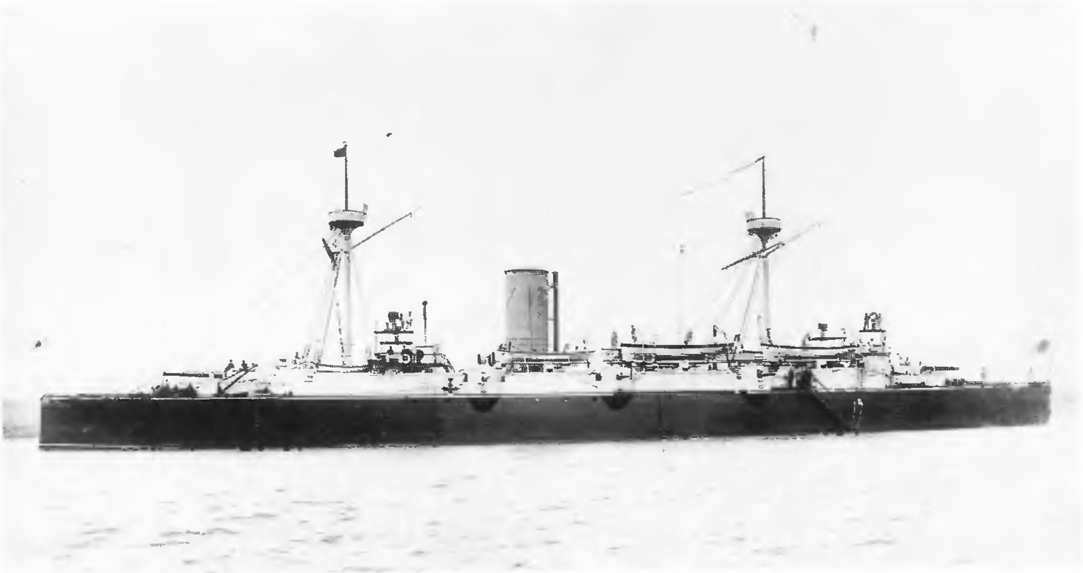


NANIWA and TAKACHIHO as completed, 1886

General

This pair were enlarged, and much improved, ESMERALDAs. The armour deck was raised 2 feet so that at the midline it was 1 foot above the water at normal draft. In the designer's own words "the openings through the protective deck are brought above water, and the considerable longitudinal length of the protective deck will make it possible to preserve trim and stability when damaged in action, much more efficiently than can be done with a protective deck wholly under water". Raising the deck was made feasible by increasing the freeboard to fifteen feet. This also had the effect of raising the big guns four feet and improving seaworthiness. The double bottom extended under the engines, boiler spaces and magazines.

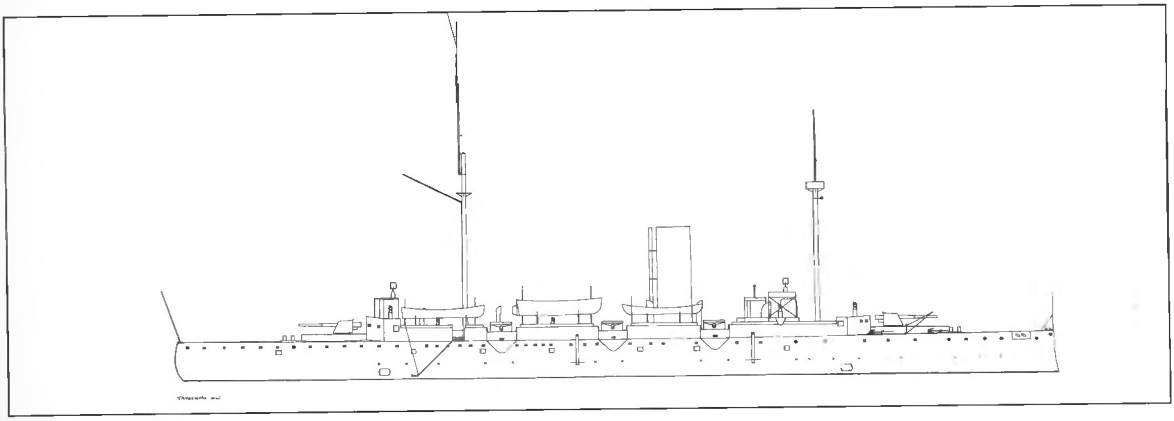
The Japanese naval commission, led by Admiral Ito, was very demanding in their requirements, insisting on the provision of ten Nordenfelt guns with 40,000 rounds of ammunition, stowage for 200 rounds for each of the 10 in guns and 450 rounds for the 6 in. In addition they wanted changes in anchors, cables, the ship's structure, cabins and provision for 325 crew instead of the original 250. Finally they wanted a speed of 18 knots instead of 17. The Japanese did not order the main and secondary guns from Armstrongs but from Krupps. The mountings for the big guns were improvements upon the ESMERALDA's and were identical to those fitted in VICTORIA and SANSPAREIL.



NANIWA during trials off the Tyne, December 1885 Photo : UNT

After the Sino-Japanese war their fighting tops were lowered to below funnel height, perhaps to avoid smoke interference but according to F T Jane because of poor sea-keeping qualities. However the then C in C China station, Sir Edmund Fremantle, reported that they performed well during the war. But surely the best assessment must have been that of Admiral Ito, commanding the Japanese fleet, who wrote to William White after the battle of the Yalu, praising their qualities, both as scouts and as battleships, and drawing attention to their solid construction.

The 5.9 in Krupp breechloaders were replaced by Elswick 6 in QF at the turn of the century and in 1902 the 10.2 in were replaced by 6 in QF so that NANIWA and TAKACHIHO both mounted a uniform armament of 8 x 6 in 45 cal QF; at about the same time TAKACHIHO's funnel was raised, photographs suggest by about 4 ft.



TAKACHIHO 1905

Careers

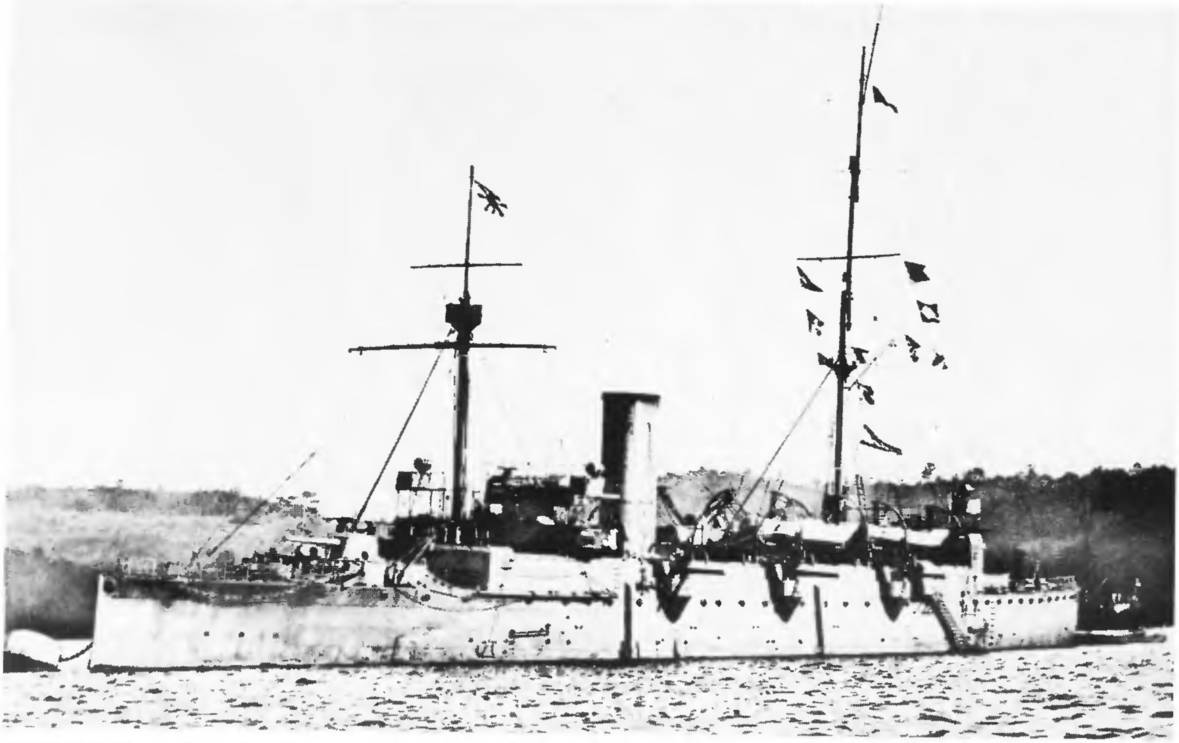
NANIWA

In December 1891, NANIWA under the command of Captain (later Admiral of the Fleet) Togo, was in Hawaii looking after Japanese interests during the revolution which deposed the last native monarch. In July 1894 NANIWA, still under Togo's command, took part in a skirmish with Chinese warships off Phungdo Island which resulted in the loss of the sloop KUANG YI and later that day sank the KOWSHING, a British merchant vessel carrying Chinese troops and munitions; all this took place before any formal declaration of war. At the decisive battle of the Yalu, on 17 September 1894, NANIWA formed part of Admiral Tsuboi's Flying Squadron. She was hit eight or nine times, but suffered no casualties. Subsequently she took part in the siege of Wei-Hai-Wei.

In the Russo-Japanese war NANIWA was in the Fourth Division of the Second Squadron, flying the Rear Admiral's flag. NANIWA took part in the fight with the VARIAG at Chemulpho on 9 February 1904. She was engaged at the battle of Ulsan on 14 August, coming up late in the fight and left to finish off the crippled RURIK.

At Tsushima as flagship of Admiral Uriu's division, NANIWA was towards the rear of the main battle line, and late in the day was forced out of line because of a hit below water. She rejoined the division during the night and took part in rounding up the scattered remnants of the Russian Fleet on the following day sustaining a 6 in shell hit aft from the crippled armoured cruiser DIMITRI DONSKOI.

NANIWA was relegated to subsidiary duties after the war. On 6 June 1912 she struck a rock off Dratona Island in the Kuriles, was beached, and became a total loss. She was stricken from the Navy List on 5 August 1912.



TAKACHIHO during the Russo-Japanese War, re-armed, with heightened funnel, and with w/t gaff at mainmasthead.
Photo : WSS

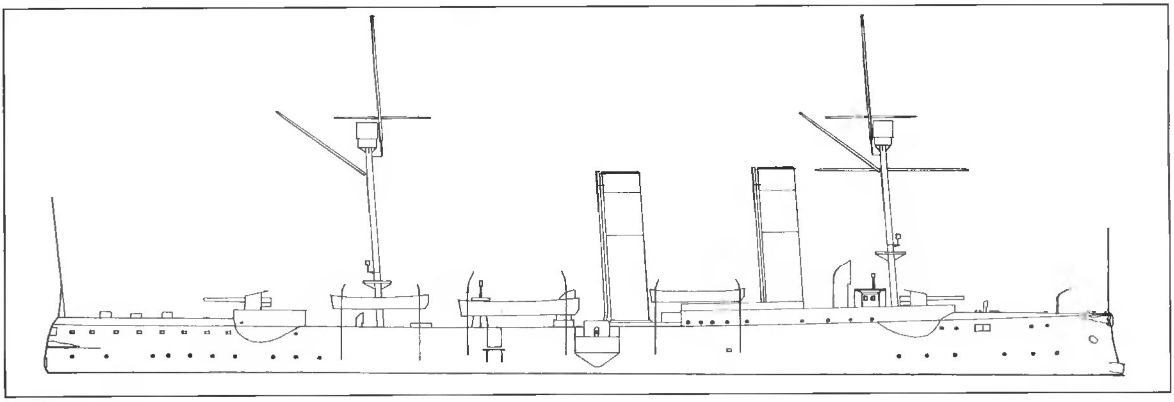
TAKACHIHO

TAKACHIHO was part of Admiral Tsuboi's Flying Squadron in the Sino-Japanese war. At the Yalu battle she was hit only once with no serious damage and no casualties. In the Russo-Japanese War at Chemulpho she was sent inshore in advance of Admiral Uriu's main body to escort the transports carrying the Japanese landing force. At Ulsan TAKACHIHO received one hit from the sinking RURIK which injured 13 men. She was at Tsushima with Admiral Uriu's Division and was hit by a large shell below the waterline. In 1907 she was converted into a minelayer. At the start of World War I, during the siege of Tsingtao, she was employed transporting men and munitions. On the night of 17-18 October 1914 while carrying 120 mines she was struck by two torpedoes fired by the German destroyer S90, the second of which caused an explosion which blew her apart leaving three survivors.

DOGALI
ex ANGELO EMO ex SALAMINIA
Italy

Yard & No	Laid down	Launched	Completed	Designer
Elswick 482	13 Feb 1885	28 Jan 1886	May 1886	W H White

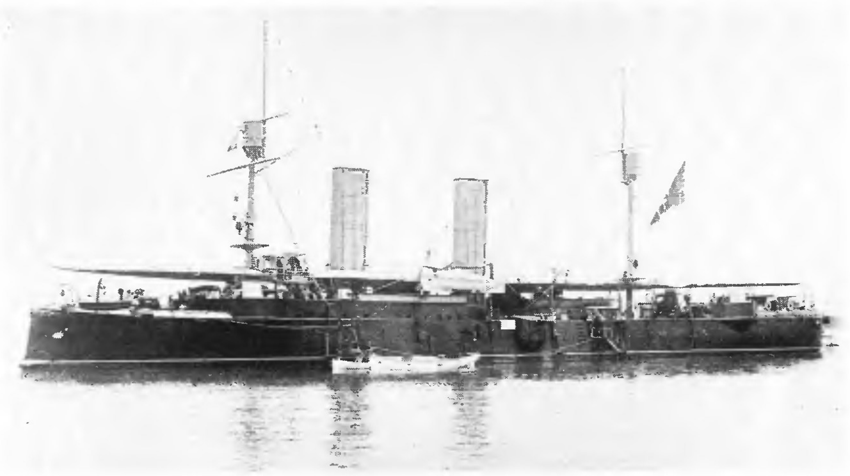
Displacement	2050 tons.
Dimensions	250 (267 oa) x 37 x 14 ft 6 in [76.1 (81.4 oa) x 11.3 x 4.5]
Armament	6 x 6 in BL (4.2 tons), 9 x 6 pdr QF, 6 Gatling mg. 4 x 14 in TT aw.
Armour	Deck 2 in slopes, 1 in flats. CT 2 in. 6 in gun shields 4½ in.
Machinery	2 sets horizontal triple expansion by R & W Hawthorn. 4 double ended cylindrical boilers. Designed IHP ND 5000 = 17.75 knots, FD 7500 = 19.5 knots. Trials IHP ND 5012 = 17.7 knots, FD 7179 = 19.66 knots.
Fuel	Coal. 200 tons normal, 480 maximum.
Complement	211



DOGALI, 1886

General

She was laid down as a stock ship. In December 1885 the Greek government had her under offer for a short time, and presumably the Greek launching name was due to this. In July 1886 the Turkish government had her under offer but later withdrew. After this SALAMINIA underwent a series of trials with different propellers with a view to obtaining higher speeds. In January 1887 an offer was received from the Italian government. Originally named ANGELO EMO by her new owners, her name was again changed to DOGALI before delivery.



DOGALI in 1900, little changed from her first entry into service.

Photo : NMM N5763

She was the first cruiser to have triple expansion engines. They were placed horizontally, because of the difficulty in fitting vertical engines under the armoured deck but this arrangement did take up more space. She was for a period the fastest cruiser afloat.

DOGALI was one of the earliest warships to mount Charles Parson's shunt dynamos, powered by a steam turbine. Three sets were carried, made by Clarke Chapman, Parsons & Co. Each set delivered 125 amps at 80 volts, - 10KV, powering 150 incandescent lamps and two searchlights, both of the latter using the full current from one dynamo. Compared with other shipboard installations the Parsons machine was much lighter and took up considerably less deck space.

DOGALI was much more suitably armed for cruiser work than her predecessors, ESMERALDA, BAUSAN and the Japanese pair. These ships were too small to provide a steady platform for their heavy guns, and they embodied the misconception that, by using their superior speed and powerful artillery, they could defeat a battleship. Given that small cruisers would be fighting other cruisers or armed merchant ships, an armament of light, rapid-firing guns was more appropriate, and no Elswick cruiser thereafter carried a gun heavier than 8.2 in. DOGALI's freeboard amidships was six feet only, and her coal capacity was small, but these drawbacks would be acceptable for a ship operating in the Mediterranean.

Career

She spent much of her time overseas in the Red Sea and off the East Coast of Africa, while in 1897 she represented Italy at the unveiling of the Grant Statue in New York. Later she served in central American waters, including a voyage up the Amazon, and finally voyaged to Montevideo where she was sold to Uruguay in January 1908 and renamed MONTEVIDEO. In 1912 she went aground off the coast of Rio Grande. Salved, she was finally scrapped in 1931, 45 years after her launch.

CHIH YUAN CHING YUAN

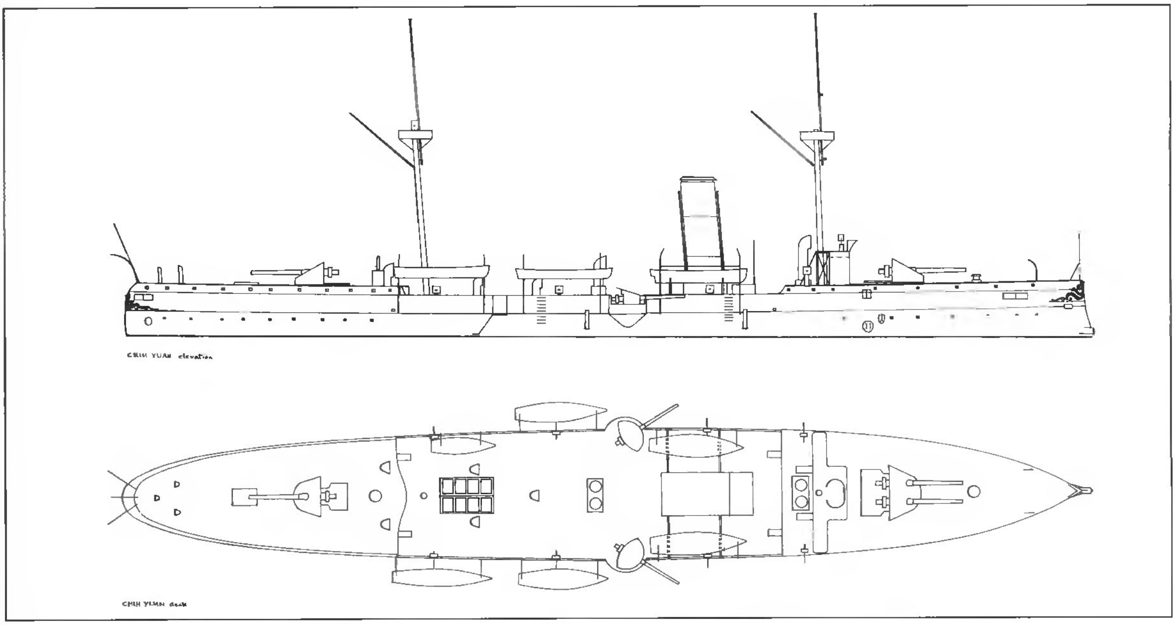
China

Yard & No	Laid down	Launched	Completed	Designer
CHIH YUAN Elswick 493	20 Oct 1885	29 Sep 1886	23 Jul 1887	W H White
CHING YUAN Elswick 494	29 Oct 1885	14 Dec 1886	9 Jul 1887	W H White

Displacement	2310 tons. (2302 tons on trial).
Dimensions	250 (267 oa) x 38 x 15 [76.1 (81.4 oa) x 11.3 x 4.6]
Armament	3 x 8.2 in (21 cm) 35 cal,13 ton Krupp BL (shell 309 lbs, charge 99 lbs, mv 1804 ft/sec). 2 x 6 in 35 cal Armstrong BL, 8 x 6 pdr QF, 2 x 3 pdr QF, 6 x 1 pdr QF. 6 Gatling mg, 4 x 14 in TT aw, 2 fixed stem and stern, 2 training broadside.
Armour	Deck 4 in slopes from 1 ft above to 18 in below wl, flat 2 in; CT 3 in; 2 in gunshields.
Machinery	2 sets horizontal triple expansion by R & W Hawthorn Leslie. 4 Navy boilers. Designed IHP ND 3300 FD 5500 = 18 knots. Trials IHP ND 3733 = 15.26 knots, FD 6892 = 18.5 knots.
Fuel	Coal. 200 tons normal, 516 tons maximum.
Complement	260.

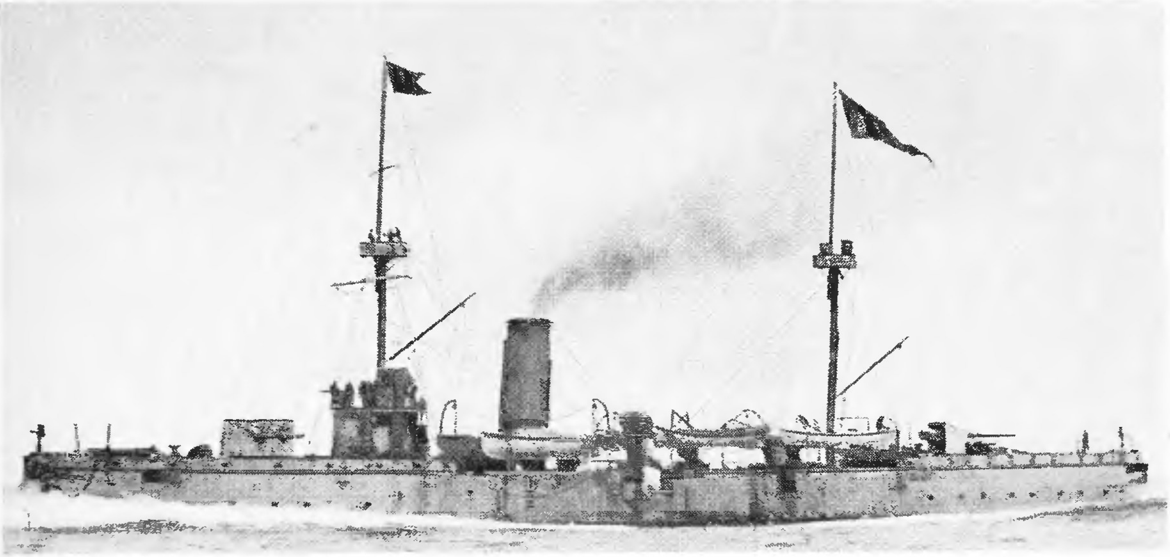
General

Ordered by Li Hung-Chang for the Peiyang fleet in October 1885 at a price of £285,000. Had double bottoms extending throughout engine and boiler rooms and over a good part of the rest of the ships' bottoms; subdivided by eleven transverse watertight bulkheads, with 60-70 watertight compartments below the waterline. The crown of the protective deck was just above the waterline amidships, but only extended 18 in below the waterline at the sides. Freeboard amidships was six feet, but an almost flush decked appearance was given by high bulwarks in the waist.



CHIH YUAN and CHING YUAN, 1887

The forward 8.2 in were in a twin mounting, a feature unique to the pair, although there was a similar arrangement for the 6 in gun armament of the Armstrong designed, but never built, State of Victoria cruisers.



CHIH YUAN running trials off the Tyne, July 1887 Photo : author's collection

The paired guns forward were on a revolving platform trained by hydraulic power or alternatively by hand tackle. Powder charges were supplied by a hydraulically operated hoist coming up between the guns. Projectiles were carried in lockers immediately below the revolving platform; they were lifted to the breech by cranes, one mounted on the outboard side of each gun. The single mounting aft also had a hydraulically operated powder hoist but was trained by hand.

The conning tower had an early type of director, enabling the captain to fire the main guns simultaneously or singly. Adjacent to the conning tower was a steel signalling station.

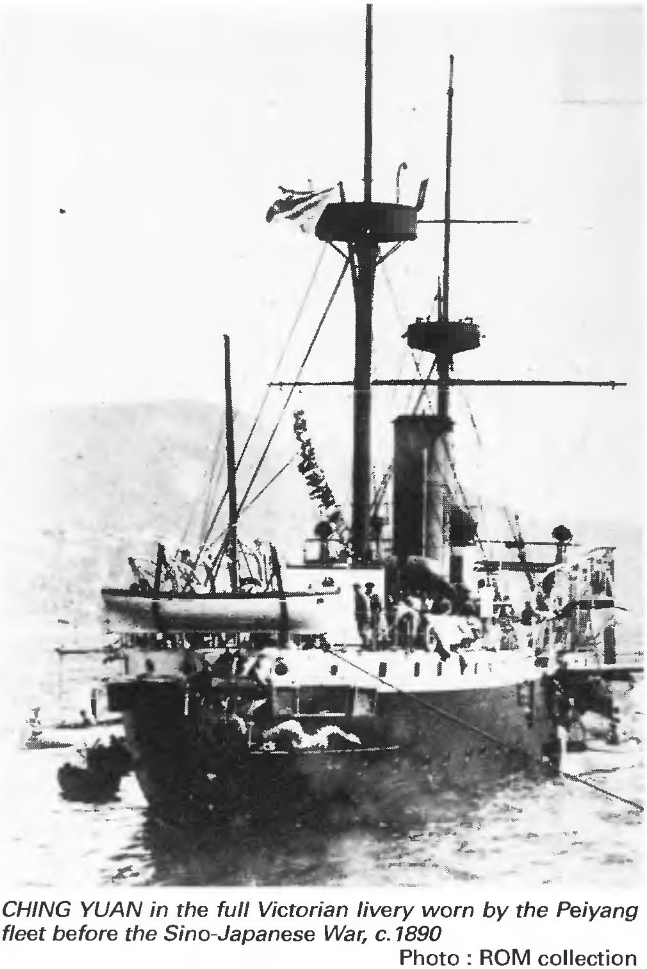
The engines were in two separate compartments separated by an athwartships bulkhead, the port engine being forward.

Like most of the early Armstrong cruisers the Chinese pair were over-gunned. The Admiralty Naval Intelligence Department, while noting their long rakish appearance, commented that the heavy guns were much exposed and the forward pair would make a fair target. These guns, it was thought, could not be worked when steaming fast into a head sea, because even in smooth water spray was thrown onto the forecastle in continuous showers by the bulge of the bow tube. The NID also commented unfavourably on the low 6 in gun sponsons, which would probably make the ships very wet at sea.

Careers

They were taken over by the Chinese Navy on 2 August 1887. The pair in company with two German built belted cruisers, the KING YUAN and LAI YUAN, and a torpedo boat, sailed for China from Spithead on 12 September 1887, the whole fleet under the command of Captain Lang RN who had the rank of Vice Admiral in the Chinese Navy.

At the Battle of the Yalu, 17 September 1894, CHIH YUAN was immediately to port of the flagship TING YUAN, with CHING YUAN out on the right wing, to port of the CHA'O YUNG and YANG WEI, soon becoming the outermost ship after the two small cruisers had been put out of action. After sustaining much damage, CHIH YUAN made in the direction of Admiral Tsuboi's flying squadron, apparently to finish off the badly damaged gun vessel AKAGI. She took on a heavy list and at 3.30 p.m. she sank, bows first, screws still whirling. CHING YUAN was set on fire three times, left the battle heading for Port Arthur, later joining up with the two Chinese battleships. She had a large shothole four feet above the waterline, 10 feet from the stern, and had two six pdr holes under her bow torpedo tube.



CHING YUAN in the full Victorian livery worn by the Peiyang fleet before the Sino-Japanese War, c.1890

Photo : ROM collection

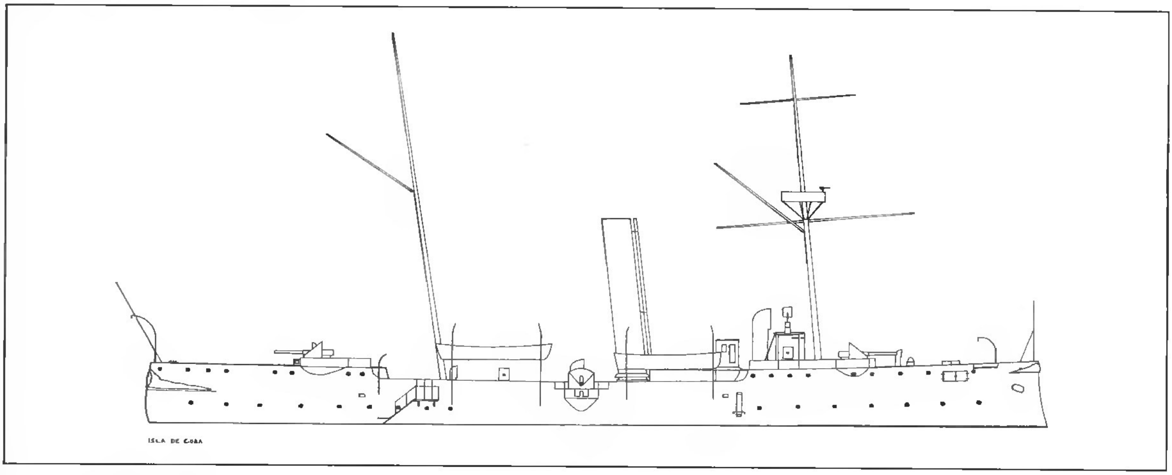
The survivors of the Chinese fleet, after undergoing repairs at Port Arthur, went on to the fortified harbour of Wei-Hai-Wei. The Japanese blockaded the harbour towards the end of January 1895, and then landed troops who captured all of the surrounding forts. CHING YUAN took an active part in the defence, bombarding the Japanese-held forts. On 9 February while shelling a fort and with the Chinese Commander in Chief, Admiral Ting, on board, she was struck by an 11 in (28 cm) shell from one of the forts on the south side of the bay. The shell, following a plunging trajectory, struck her on the starboard side, penetrated the torpedo room a few inches above water, went through the $2^{1}/_{2}$ in flat part of the armoured deck, bursting the water-tight bulkheads and passing out of the port side under the waterline. If her water-tight doors had been in good order she might have been saved, but she sank within 30 minutes, 60 of her crew being drowned. She was raised and scrapped 1896-97.

ISLA DE LUZON ISLA DE CUBA

Spain, later USA

Yard & No	Laid down	Launched	Final Trials	Designer
ISLA DE LUZON				
Elswick 497	25 Feb 1886	13 Nov 1886	22 Sep 1887	W H White
ISLA DE CUBA				
Elswick 498	25 Feb 1886	11 Dec 1886	22 Sep 1887	W H White

Displacement	1038 tons. 1053 tons on trial.
Dimensions	185 (197 oa) x 30 x 11 ft 6 in [56.4 (60.0 oa) x 9.14 x 3.5] Freeboard amidships 5 ft
Armament	6 x 4.7 in (12 cm) Hontoria BL, 4 x 6 pdr QF, 2 x 1 in mg, 2 mg, 3 x 14 in TT aw.
Armour	Deck: slopes 2½ in, flat 1½ in - 1 in at ends, CT 2 in.
Machinery	2 sets horizontal triple expansion by R & W Hawthorn Leslie. 2 single-ended cylindrical boilers. Designed IHP ND 1700 = 14 knots, FD 2200 = 15 knots. Trials, CUBA IHP ND 1897=14.03 knots for 6 hrs, FD 2627=15.92 knots on measured mile. LUZON ND 14.19 knots, FD = 15.49 knots on measured mile. 15.22 knots for 2 hours.
Fuel	Coal. 100 tons normal. 200 tons maximum.
Complement	70.



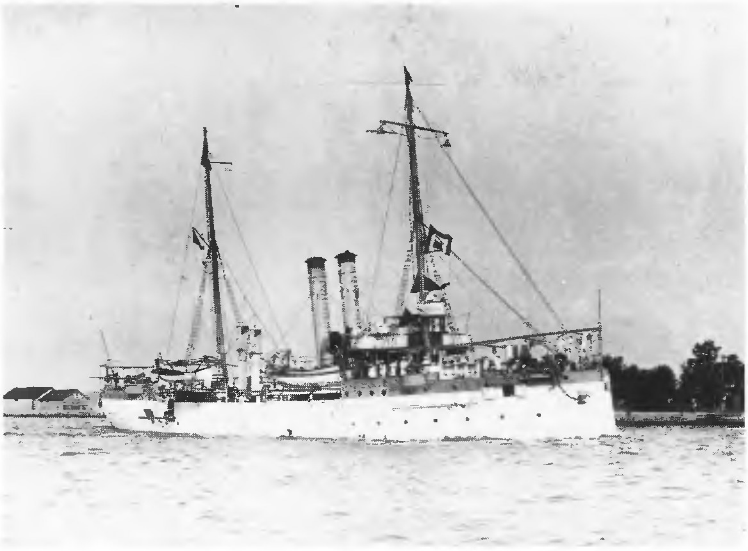
ISLA DE CUBA 1887

General

Third class cruisers, smaller versions of DOGALI, with a reduced armament and four knots slower.

Spain began a major shipbuilding programme in the 1880s, and Armstrongs sent their chief naval architect W H White to Spain to secure orders. He was unsuccessful in obtaining a contract for a battleship of a modified COLLINGWOOD type but in his last report to Armstrongs directors in September 1885, he stated that he was preparing designs and tenders for three cruisers at the request of the Spanish government. Orders for two third-class cruisers, ISLA DE CUBA and ISLA DE LUZON were placed in January 1886, specifying vessels of 1030 tons displacement, 14 knots at ND and 15 knots at FD. Spain placed the tender for a first-class type, the REINA REGENTE, with the Clydebank firm of Thomsons but the Armstrongs design was sold to the U.S.N. as the basis for USS BALTIMORE, completed in 1890.

Work on the pair was slowed up over a three month period while the Spanish government delayed on decisions regarding the number of anchors and the length of cables. By March 1887, both had been tried at sea with satisfactory results, but final trials were suspended by orders from Spain in order to allow for the installation of torpedo tubes. There was another delay due to the late ordering of the armament. Preliminary trials were held on 16 and 17 June 1887 but were not satisfactory because of unfavourable weather and were further postponed because the overseeing commissioners referred the question of modifications of the trial programme to Madrid. Sea trials were completed 22 September but the commissioners asked for a further trial at moorings in order to test the boilers. The pair were taken over by Spain 16 November 1887 and left the Tyne on 6 January 1888.

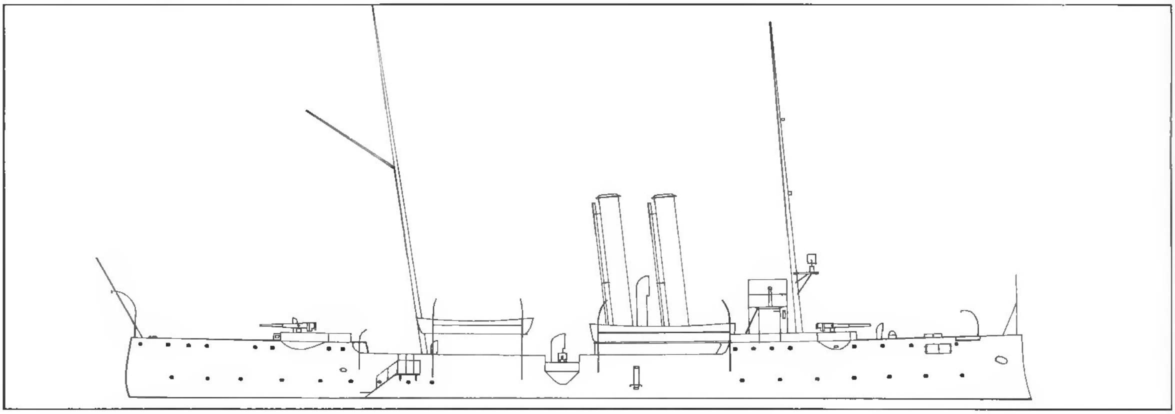


ISLA DE LUZON, reboilered and with twin funnels, serving as a training ship with the Illinois Naval Militia, 1913 Photo : USN NH 75672

Reference books give the BL guns as Spanish made Hontoria type, but the yard report book suggests that they were Armstrong products. They were certainly mounted on Vavasseur centre pivot mountings. The waist guns were removed not long after completion. As built, both had a small top on the foremast with a machine gun; by 1898 the tops had been removed.

Like the DOGALI, the Spanish pair had their triple expansion engines mounted horizontally in order to keep the cylinders below the armour deck.

This arrangement resulted in increased vibration and took up more space, as the engines had to be installed in tandem and in separate compartments, instead of side by side. Each of the two compartments was 15 feet long while in contrast, the Romanian ELISABETA with vertically mounted engines developing about twice the IHP, had a single engine room 26 feet long. The two boilers were single-ended cylindrical, with a diameter of 10 ft 3 in, a length of 19 ft and operating at a pressure of 150 lbs. The boiler room was 34 ft long and there was a single tall funnel. Both were reboilered with Babcock and Wilcox watertube boilers with two tall, thin smokestacks while in USN service, probably between 1908 and 1911.

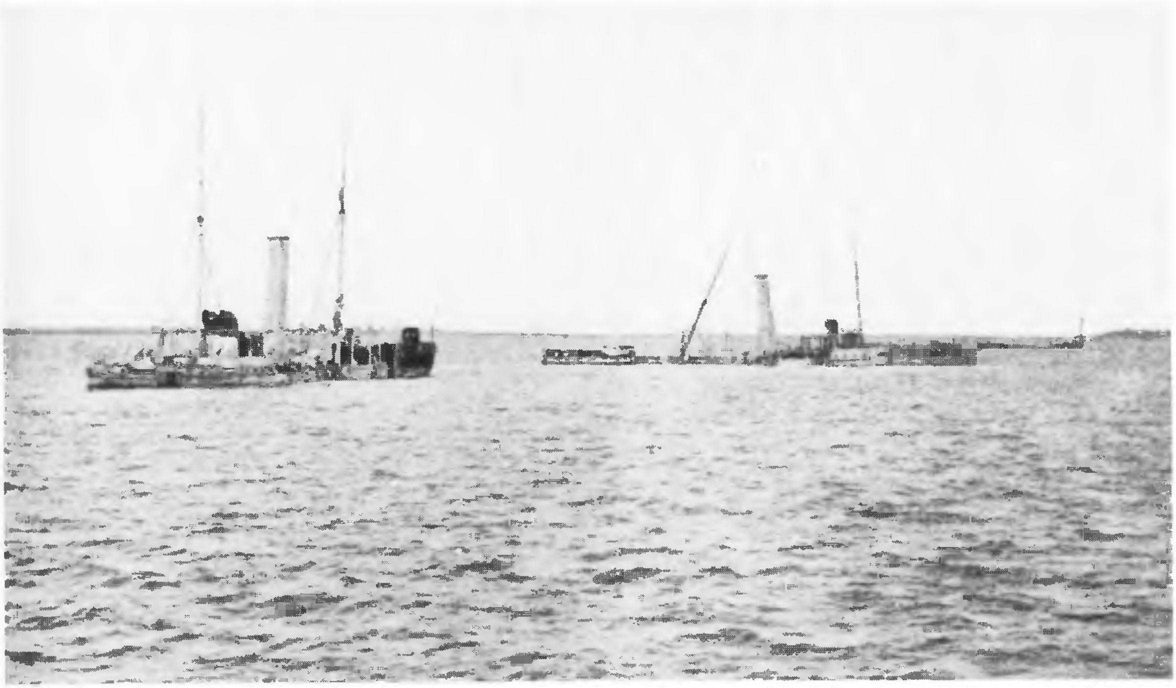


ISLA DE CUBA in US service, re-boilered and re-armed, 1910

Careers

Both took part in the campaign in Morocco against the Rifs and then formed part of the instructional squadron; in 1897 they went to the Far East to become part of Rear Admiral Montojo's Phillipine squadron.

At the battle of Manila Bay on 1 May 1898, when Montojo's weak fleet was annihilated by Commodore Dewey's Asiatic squadron, ISLA DE CUBA and ISLA DE LUZON were on the right flank of the Spanish fleet, circling together at speed. Both rescued survivors from Montojo's disabled flagship, the cruiser REINA CRISTINA. The Admiral transferred his flag to CUBA, which was then anchored in shallow water near LUZON, and both were scuttled. Later on the same day, boats crews from USS PETREL set the pair on fire. During the engagement LUZON had her forward guns disabled by a large shell, and there may have been three hits in all with six of her crew injured. CUBA was hit five times, four by 6 pdrs, and had two men injured.



ISLA DE LUZON (left) and ISLA DE CUBA off Cavite Navy Yard after the Battle of Manila Bay, May 1898
Photo from Report of US Navy Secretary, 1898

Both ships were salvaged 2 Dec 1898 and then repaired in Hong Kong, rearmed with 4 x 4 in QF and commissioned into the United States Navy in 1900, both retaining their original names and being re-rated as gunboats. Both took part in action against the Philippine insurgents. CUBA left for the US in 1904. She was repaired, re-armed with 6 x 3 in guns in 1906 and was then sold to Venezuela in April 1912. Renamed MARISCAL SUCRE, she remained in service until she was scrapped in 1940.

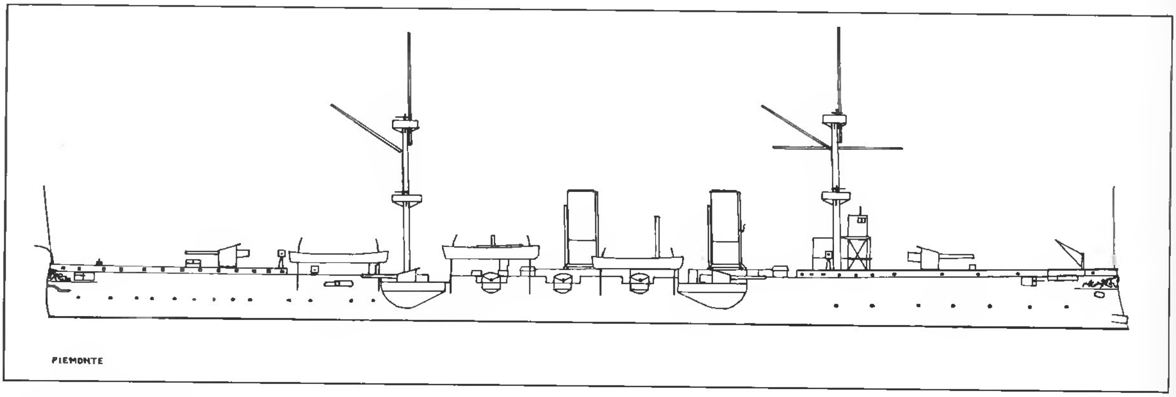
LUZON departed for the US in 1902 and in 1903 she served with the Louisana naval militia and then with the Illinois naval militia on the Great Lakes with her 4 in guns being replaced with 4 - 3 in. She served as a training ship there until September 1918, when she was attached to the naval torpedo station at Narragansett Bay as a training ship until decommissioned in 1919. Later that year she was struck off the Navy List, sold in the following year to the Bahama and West Indies Trading Company, renamed REVIVER and used as a merchant salvage ship. She was scrapped in 1940.

PIEMONTE

Italy

Yard & No	Laid down	Launched	Completed	Designer
Elswick 510	1887	23 Aug 1888	8 Sep 1889	Phillip Watts

Displacement	2473 tons. 2597 tons on trial. 2900 tons full load.
Dimensions	310 (321 oa) x 38 x 15 (16 ft 6 in deep) [92.73 (97.8 oa) x 11.62 x 4.9 (5.1 deep)]
Armament	6 x 6 in 40 cal QF, 6 x 4.7 in 40 cal QF, 10 x 6 pdr QF, 6 x 1 pdr QF, 4 mg. 3 x 14 in TT, 2 broadside, 1 bow aw.
Armour	Deck : slopes 3 in - 2 in, flats 1 in; CT 3 in.
Machinery	2 sets VTE. 4 cylinder engines by Humphrys Tennant, cylinders 36 + 55 + 2 x 60 in, stroke 27 in. Boilers 4 cylindrical. Designed IHP FD 11,500 = 21.5 knots. Trials IHP ND 7050 = 20.5 knots, FD 12,700 = 22.4 knots.
Fuel	Coal. 200 tons normal, 600 tons maximum. Radius at full speed 1950 miles. At 10 knots radius was 7,000 miles.
Complement	12/245

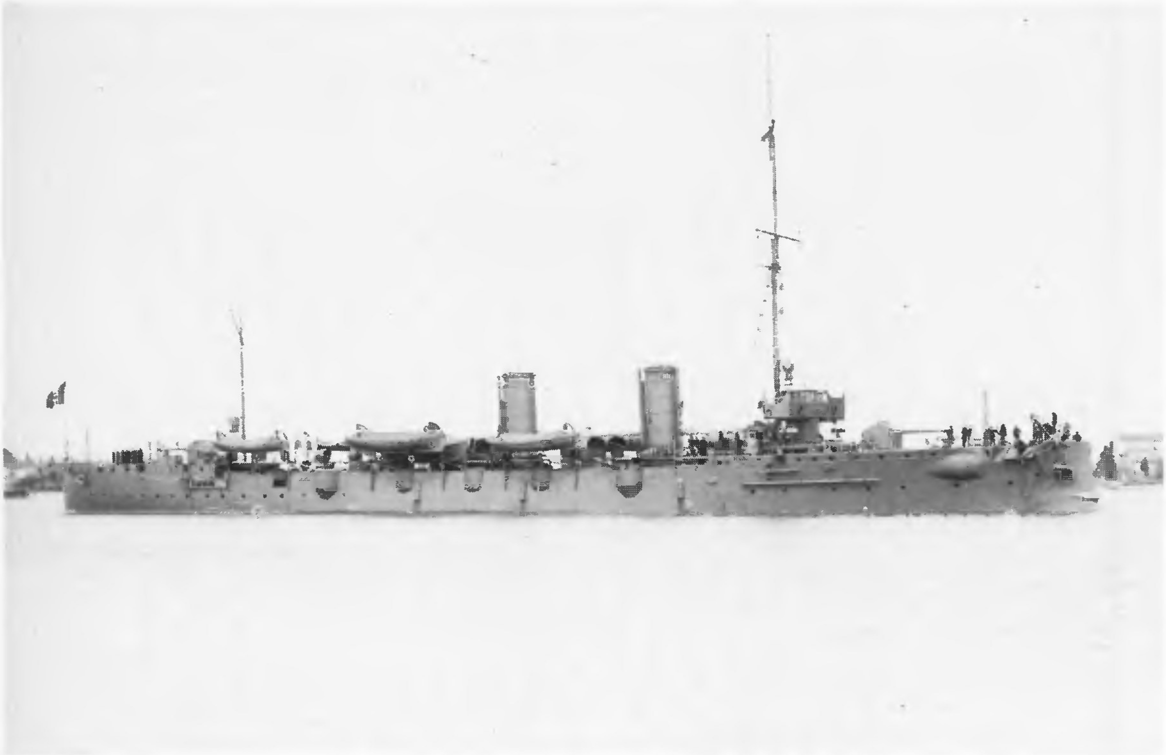


PIEMONTE, 1889

General

Laid down as a stock cruiser, being Phillip Watts' first design for Armstrongs. Armament was to have been 2 x 8 in BL and 4 x 6 in but when bought by the Italian government in 1888 an all quick firing armament was stipulated. She lacked a raft body above the protective deck; freeboard amidships was 8 feet 3 in. The large sponsons to the waist 6 in guns made her very wet except in the calmest weather. Watts achieved a high speed by introducing vertical, four cylinder triple expansion engines. In order to keep the cylinders below the armour deck and without using glacis plates they were given a short stroke, and in consequence they were quick running. This was normal practice for torpedo craft but a daring innovation for cruisers. Another measure to keep the engines and boilers below the waterline was to omit the double bottom from the boiler rooms and in wake of the crank pits.

PIEMONTE was the first major warship to mount an all quick firing armament. With a combination of brass cartridge cases, a quick acting breech mechanism, and arranging for the guns to recoil in the line of fire within a non-recoiling cradle, rates of firing were about six time faster than comparable breech loading guns. Sighting was made easier and more accurate by attaching the sights to the cradle. The guns could be easily trained with a shoulder piece. In trials made in 1888, Armstrong's 4.7 in fired ten rounds in 47½ seconds; an ordinary 5 in breech-loader took 5 minutes and 7 seconds to fire the same number of rounds. The new guns were more accurate; at the trial at Shoeburyness in 1889, a target of 6 ft square was hit five times running at a range of 1500 yards, in the space of 31 secs.



PIEMONTE, still with 6in guns on forecastle and quarterdeck but with all 4.7in in her waist and without the big sponsons which made her so wet, 1912

Photo : Author's collection

PIEMONTE was rearmed in 1891 with 2 x 6 in and 10 x 4.7 in QF, and in 1913 her armament was again reduced to 10 x 4.7 in. At about the time of her first rearming the military tops were removed, her rig then being a tall pole foremast and a short light main mast.

Career

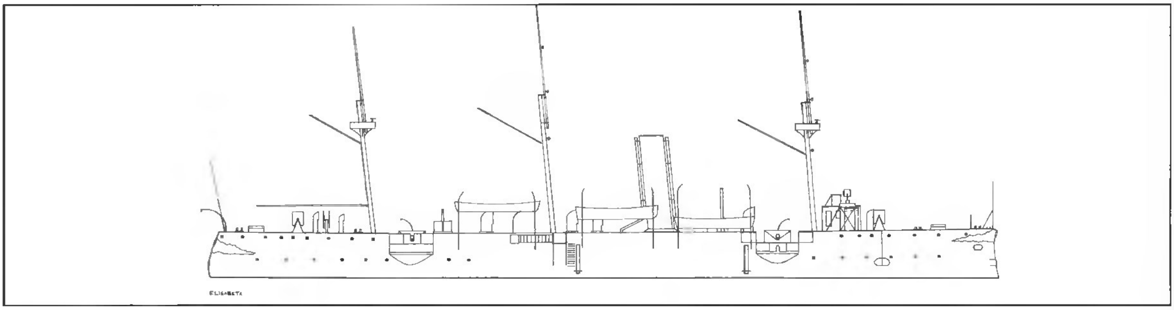
In the Italian-Turkish War of 1912 she saw service in both the Mediterranean and Red Sea helping to sink a number of small warships at Kunfuda in the Red Sea 7 January 1912. During World War One PIEMONTE spent much time in Salonica while attached to the Anglo-French Levant Squadron. After the war there were plans to convert her to a trials ship for torpedo work, but these were abandoned and she was struck off the Navy List 15 May 1920 and scrapped soon after.

ELISABETA

Romania

Yard & No	Laid Down	Launched	Final Trials	Designer
Elswick 517	17 May 1887	29 Dec 1887	19 Sep 1888	Phillip Watts

Displacement	1325 tons.
Dimensions	222 (240 oa) x 33 ft 6 in x 12 [67.67 (73.15) x 10 x 3.66]
Armament	4 x 5.9 in (15 cm) 35 cal Krupp BL, 4 x 6 pdr QF, 2 x 37 mm QF. 2 mg. 4 x 14 in TT, 1 bow, 1 stern, 2 broadside, all aw.
Armour	Complete protective deck. 3½ in slopes, 1½in flats amidships, 1 in ends. 4 in athwartship bulkheads at bow. CT 3 in.
Machinery	2 sets VTE by R & W Hawthorn Leslie. Boilers 4 single-ended cylindrical. Contract IHP ND 3000 = 16.5 knots. FD 4500 = 17.5 knots. Trials IHP ND 4271 = 18.064 knots. FD 4714 = 18.3 knots.
Fuel	Coal. 250 tons normal, 322 tons maximum.
Complement	140



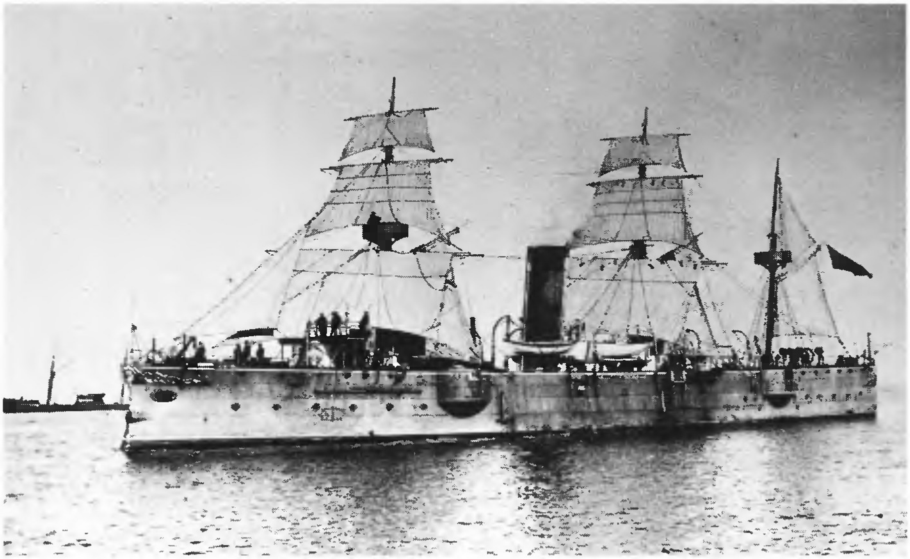
ELISABETA, 1888

General

In May 1887 the Elswick Yard Book reported that an order had been received from Romania for a 1300 ton cruiser to be armed with 4 x 6 in guns and four torpedo tubes. Speed was to be $17\frac{1}{2}$ - 18 knots, with the armour deck to be $1\frac{3}{4}$ in on the flat and $3\frac{1}{2}$ in on the slopes.

She was curiously old fashioned in appearance with her main guns on the broadside so that she had no right ahead or astern fire and was barque rigged. Preliminary trials were run as early as April 1888 but the final trials did not take place until the September, when 18.3 knots was achieved, although without the complete armament, as Romania wished to mount Krupp and not Armstrong guns in the main battery. There must have been dissatisfaction about the trial on the part of the Romanians, as the question of trial speed was referred to arbitration but given in Armstrongs favour.

For years she was Romania's principal warship, her primary function being to train stokers and mechanicians.



ELISABETA under all plain sail off the Tyne in the summer of 1888, her hull still in grey undercoat and without her main armament Photo : Vickers

Career

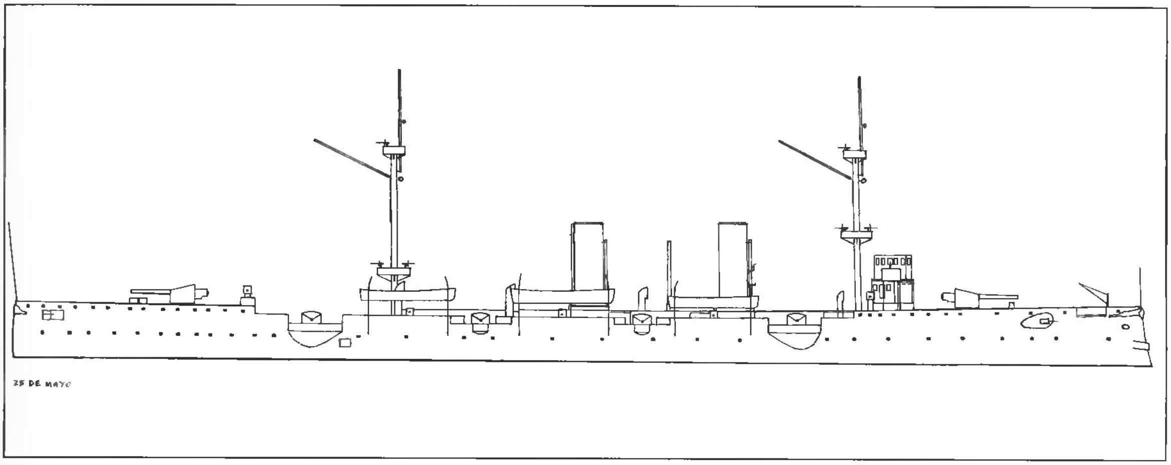
She was fitted with her armament at Galatz in 1888/89. Most of her early years were spent in the Black Sea but she made extended Mediterranean cruises. In 1895 ELISABETA took part in the Kiel Canal opening ceremonies and later visited Sweden. She underwent major repairs in 1904/05, her rig being reduced to two pole masts; she had lost her yards some years previously. At the same time 4.7 in QF were substituted for the 5.9 in BL.

In 1915 during World War I ELISABETA had all her guns and torpedo tubes removed and remained at Sulina in the Danube estuary as a guardship throughout the war. After the war she was at first a harbour support ship for the Naval Academy at Tiglina, then accommodation ship at Galatz, and then at Sulina before being scrapped in 1926.

VEINTICINCO DE MAYO
ex NECOCHEA
Argentina

Yard & No	Laid down	Launched	Final Trials	Designer
Elswick 541	18 Jun 1888	5 May 1890	Jan 1891	Phillip Watts

Displacement	3180 tons. 3312 tons on trials.
Dimensions	330 (351 oa) x 43 x 16 [100.71 (106.98 oa) x 13.1 x 4.87] Freeboard amidships 9 ft.
Armament	2 x 8.2 in (21 cm) 40 cal Krupp BL (210 lb projectile), 8 x 4.7 in 40 cal QF, 12 x 3 pdr QF, 12 x 1 pdr QF, 3 x 18 in TT aw.
Armour	Deck, slopes 4½ in - 3½ in, flats 1¾ in; CT 4 in.
Machinery	4 sets VTE by Humphrys Tennant. 4 double ended cylindrical boilers. Designed IHP ND 8300 = 20.75 knots, FD 14,000 = 22 knots. Trials IHP ND 8735 = 21.237 knots, FD 14,150 = 22.43 knots.
Fuel	Coal. 300 tons normal, 620 tons maximum. Nominal endurance of 10,000 miles at 10 knots.
Complement	276



VEINTICINCO DE MAYO 1891

General

In June 1886 the Elswick Yard was authorised to lay down a new stock cruiser with the same armament as originally planned for the PIEMONTE but with 8 x 4.7 in 36 pdr QF instead of 4 x 6 in. Speed was to be the greatest practicable on a length of 330 ft and the deck protection was to be 4½ in on the slopes and 1¾ in on the flats. In July 1889 she was offered to Chile but was sold to Argentina in September. After initial good progress construction was held up as the bow and stern needed modification because of a change in the size of the torpedo tubes from 14 in to 18 in. After launching her name was changed.

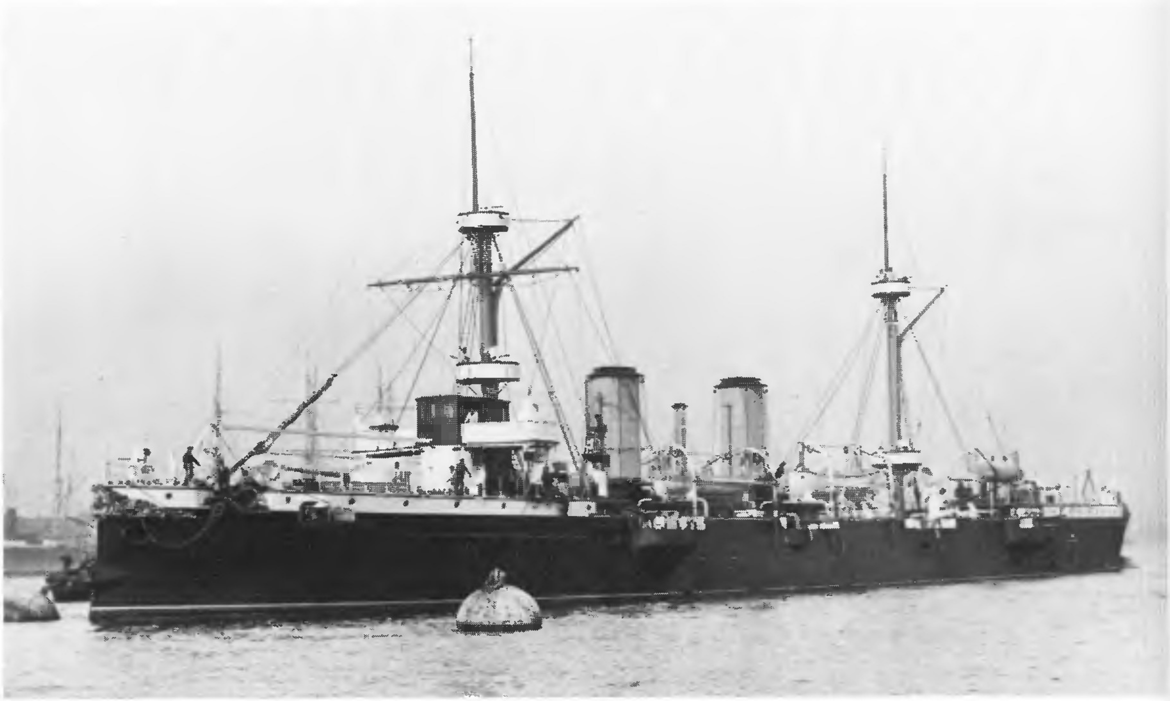
The double bottom was not complete in wake of the boiler and engine rooms. The crown of the armour deck was 1 ft above the water line at designed draught. At one point the question of applying side armour at a cost of £8,000 - £10,000 was considered but, although the RESISTANCE experiments had demonstrated that relatively thin armour provided protection against quick-firing guns, Argentina opted to have her completed as originally designed, probably influenced by the fact that the Admiralty decided not to fit side armour to their cruisers.

The Admiralty Naval Intelligence Department noted that her ammunition supply was provided by a manually operated endless leather belt fitted with hooks rising from the handling room to the main deck. The comment was made that "a great deal had been sacrificed to obtain high speed and space between the boilers and bottom plates and armoured deck were small and the height of the engine room was limited".

Career

The Argentine government was slow in making the final payments and she lay in the Tyne, completed and with her crew on board, from April to July 1891 when payment was made. She sailed from the Tyne in August, arriving at Buenos Aires on 17 September after a very rough Atlantic crossing during which the new ship performed "in a most satisfactory manner".

She had an uneventful life in Argentine service and was discarded about 1921.

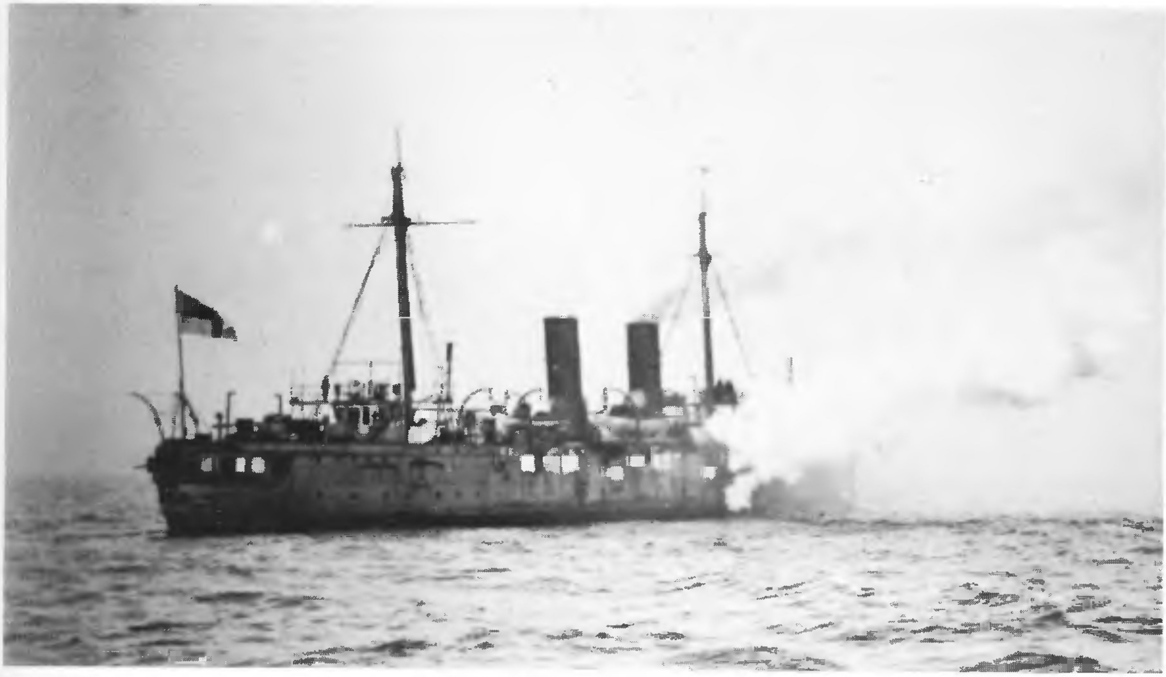


VEINTICINCO DE MAYO at buoys in the Tyne in the summer of 1891, complete but awaiting final payment.
Photo : Vickers

KATOOMBA ex PANDORA / MILDURA ex PELORUS / WALLAROO ex PERSIAN
Great Britain

Yard & No	Laid down	Launched	Final trials	Designer
KATOOMBA Elswick 542	15 Aug 1888	27 Aug 1889	1 Dec 1890	DNC
MILDURA Elswick 543	15 Aug 1888	27 Nov 1889	20 Dec 1890	DNC
WALLAROO Elswick 544	15 Aug 1888	5 Feb 1890	27 Jan 1891	DNC

Displacement	2613 tons (trials)
Dimensions	265 pp (278 oa) x 41 x 15 ft 6 in [80.8 (84.7 oa) x 12.5 x 4.7]
Armament	8 x 4.7 in QF, 8 x 3 pdr QF, 1 x 7 pdr, 4 Nordenfelt mg. 4 x 14 in TT aw, one bow, two broadside, one aft.
Armour	Deck 2 in slopes, 1 in on flat, CT 3 in.
Machinery	Two sets VTE by R & W Hawthorn Leslie. Four double-ended boilers. Designed IHP ND 4500 = 18 knots, FD 7500 = 19.5 knots. Trials IHP ND 4528. No FD trial.
Fuel	Coal. 300 tons normal, 442 tons maximum.
Complement	210

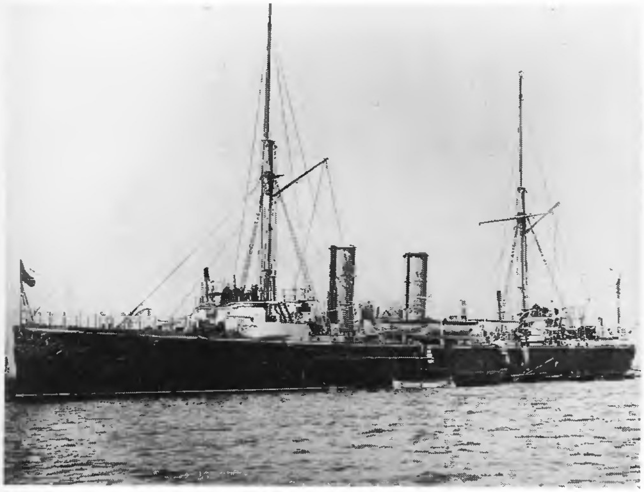


WALLAROO on gunnery trials, January 1891. Note housed topmasts. Photo : NCL

General

PEARL class third class cruisers. Five of the nine ships, including the three Armstrong vessels, were built under an agreement (subsequently embodied in the Imperial Defence Act of 1888) made in London in 1887 with representatives of the Australian Colonies, for a squadron of cruisers designed for commerce protection in Australasian waters. Britain was to pay the cost of construction, armament and manning, while the colonies in return would pay an annual subsidy for twelve years on the understanding that the ships would be stationed in Australasian waters. Originally they were to be named PANDORA, PELORUS and PERSIAN respectively, but after the launching they were given names of aboriginal origin. The PEARLs were closely modelled on the MEDEA class but carried an all QF armament instead of the breech loaders that the latter carried.

The three were much delayed - up to 15 months - by difficulties with machinery which were outside Armstrongs' control. KATOOMBA while running preliminary trials in November 1890 had an eruption of flames from the boilers into the stokehold killing four men and injuring 11. Modification of the boilers of all three were made but forced draught trials were given up; no reasons were given for this. Final results must have been satisfactory as all three were accepted.



MILDURA in full Victorian livery soon after completion Photo : IWM Q21513

Careers

KATOOMBA commissioned for the Australia station at Chatham on 24 March 1891 as flagship of the Auxiliary Squadron. She led her consorts into Sydney harbour on 5 September 1891. Shortly after her arrival she was damaged in a collision with the tug YATALA in Port Adelaide. She spent her whole active career in Australian and New Zealand waters; sailed for home 16 January 1906 and was sold 10 July 1906 at Portsmouth for £8,500 and broken up at Morecambe.

MILDURA commissioned at Chatham on 18 March 1891; she arrived in Sydney with the Auxiliary Squadron on 5 September 1891. In June 1901 she was part of the escort of the OPHIR carrying the Duke and Duchess of York (later King George V and Queen Mary) to New Zealand. She sailed for England in 1905 and was sold 3 April 1906 to Garnhams for scrapping.

WALLAROO commissioned at Chatham for Australia on 31 March 1891 and with the remainder of the Auxiliary Squadron arrived in Sydney harbour on 5 September 1891. She then paid off into reserve until May 1894 when she was commissioned for service. In July 1900 she was sent to China to join the European forces quelling the Boxer rebellion. In January 1904 four men were killed and three more injured in a boiler explosion. She sailed for England on 11 January 1906 and later that year she was attached to HMS INDUS, the harbour training establishment for mechanicians at Devonport, moving early in 1914 to HMS PEMBROKE at Chatham for the same task. Recommissioned and rearmed in November 1914 she soon reverted to harbour service and in March 1919 was renamed WALLINGTON. She was sold out of service 27 February 1920 and scrapped by G Sharpe.

SIRIUS SPARTAN

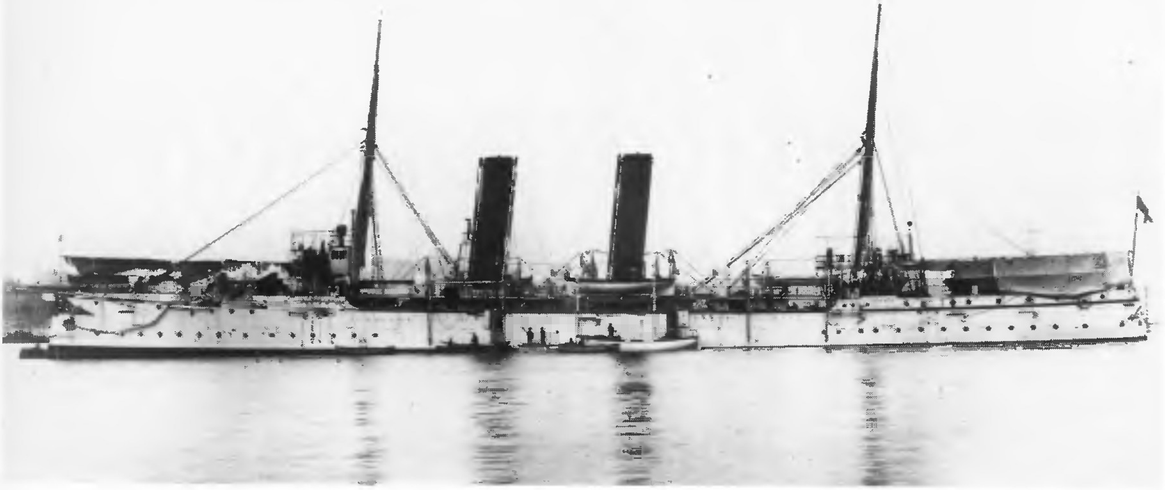
Great Britain

Yard & No	Laid down	Launched	Left Tyne	Designer
SIRIUS Elswick 564	Aug 1889	27 Oct 1890	4 Sept 1891	DNC
SPARTAN Elswick 565	Aug 1889	25 Feb 1891	24 Mar 1892	DNC

Displacement	3601 tons (3492 tons on trials) Sheathed and coppered.
Dimensions	300 x 43 ft 10 in x 17 ft 6 in [91.4 x 13.4 x 5.3]
Armament	2 x 6 in 40 cal QF, 6 x 4.7 in 40 cal QF, 8 x 6 pdr QF, 1 x 3 pdr, 1 x 9 pdr, 4 Nordenfelt mg, 4 x 14 in TT.
Armour	Deck: slopes 2 in, flats 1¼ in. Glacis plates 5 in. CT 3 in.
Machinery	Two sets VTE by Maudslay Son & Field. Four double-ended boilers. Designed IHP ND 5500 = 18 knots, FD 9000 = 20 knots. Trials IHP ND 7435 = 19.25 knots, FD 9188 = 19.35 knots.
Fuel	Coal. 440 tons normal, 532 tons maximum.
Complement	262

General

The pair belonged to the APOLLO class. The Naval Defence Act provided for the building of 70 warships, of which 29 were to be protected cruisers, second class, of a modified MEDEA type. Of these, 12 were to be built by private yards. In the event 21 belonged to the APOLLO class, and eight to an improved type, the ASTRAEA class.

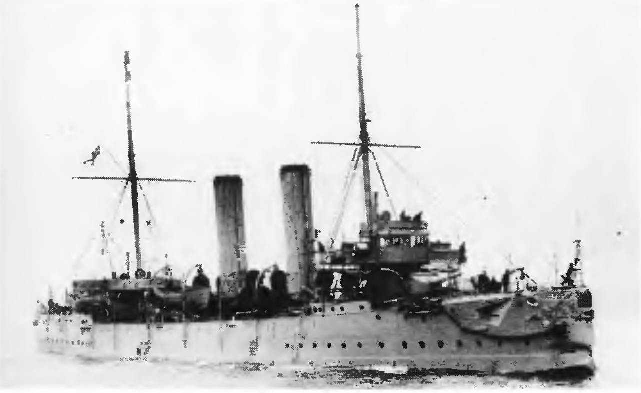


SIRIUS in Plymouth Sound before leaving for South America, 1892 Photo : IWM Q40771

Armstrongs were asked to tender for one, two or three second class cruisers and tenders for two were accepted in July 1889. SIRIUS's progress was uneventful but SPARTAN's was delayed by a flaw in one of the propeller shafts, Maudslays' responsibility.

It is interesting to compare them with NUEVE DE JULIO, a near contemporary of almost identical displacement. The Argentine ship was 54 ft longer, 2 in beamier with a freeboard amidships of 9 ft 6 in . SIRIUS's freeboard was 6 ft 5½ in only. NUEVE DE JULIO developed 14,000 IHP with ND and 5,000 IHP more with forcing, giving speeds of 2½ and 3½ knots greater at normal and forced draught respectively. How was all of this accomplished? First, SIRIUS carried 75% of fuel capacity at trial displacement, while the Argentine cruiser carried only 45%. Second, the air pressure for forced draught was 0.81 ins for SIRIUS and 2 in for NUEVE DE JULIO, so that the latter ship forced her boilers to an unacceptably high level; it would have been impossible to have maintained her trial speed for more than a very limited period without the risk of leaking boiler tubes. Finally, SIRIUS carried a larger supply of ammunition for each gun, with 250 rounds for each 6 in and 4.7 in compared with NUEVE DE JULIO's 150 rounds for each 6 in and 200 rounds for each 4.7 in. Much of the Armstrong ships superiority was on paper, rather than in practical service.

These two second class cruisers were Armstrong's only contribution to the Naval Defence Act programme, the firm building none of the programme's four contract battleships, five first class cruisers and six torpedo gunboats.



SPARTAN soon after the introduction of the grey livery in 1903
Photo : MPL

Careers

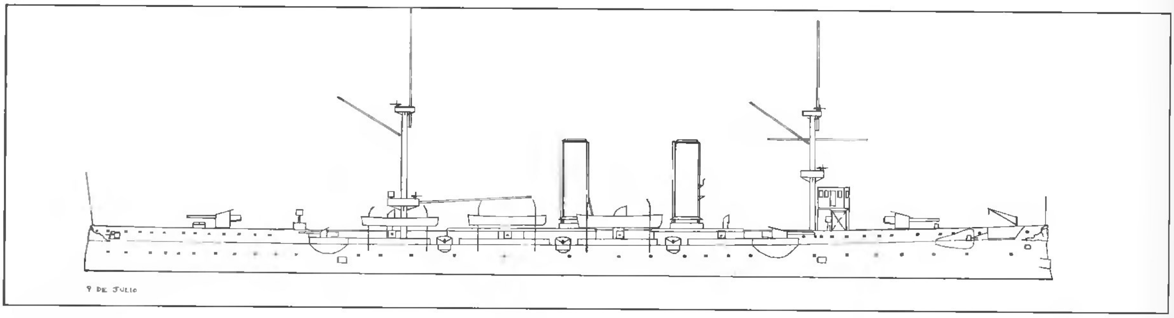
SIRIUS Flagship South East Coast of America 1892-95. China 1903-05. Attached Fourth Cruiser Squadron North America and West Indies 1912-13. Nore 1914-15. West Africa 1915-18. Expended as blockship at Ostend 23 April 1918.

SPARTAN Mediterranean 1894-95. China 1895-97. Drill ship Holyhead 1903-05. Tender to DEFIANCE at Devonport from 1907, and renamed DEFIANCE II Sept 1921. Sold 26 June 1931 to Shipbreakers Ltd and probably broken up at Plymouth.

NUEVE DE JULIO
Argentina

Yard & No	Laid down	Launched	Final Trials	Designer
Elswick 570	Feb 1891	26 Jul 1892	27 Jan 1893	Phillip Watts

Displacement	3557 tons. 3578 tons on trials.
Dimensions	354 (372 ft 6 in oa) x 44 x 16 ft 6 in [107.9 (113.54 oa) x 13.41 x 5.03] Freeboard amidships 9 ft 6 in.
Armament	4 x 6 in 40 cal QF, 8 x 4.7 in 40 cal QF, 12 x 3 pdr QF, 12 x 1 pdr QF. 5 - 18 in TT, 1 bow, 4 broadside.
Armour	Deck: slopes 3½ in - 4½ in, flats 1¾ in. CT 4 in.
Machinery	2 sets VTE by Humphrys Tennant. 8 single-ended cylindrical boilers. Designed IHP ND 9000 = 21.25 knots, FD 13,500 = 22.5 knots. Trials IHP ND 8878 = 21.98 knots, FD 14,185 = 22.74 knots.
Fuel	350 tons normal, 772 tons maximum. Nominal radius of 10,000 miles.
Complement	327

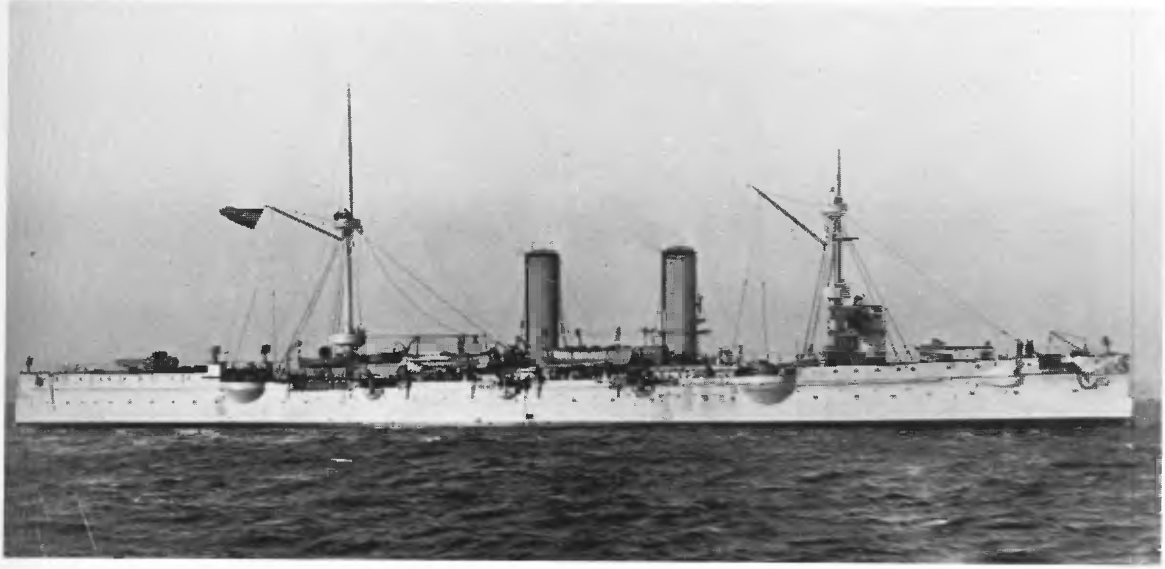


NUEVE DE JULIO 1893

General

The genesis of this vessel is outlined in a short memorandum by Phillip Watts to the directors in January 1890; he recommended laying down another stock ship to keep yard factilities employed and the labour force intact. This last point was particularly important, as the Tyne had much work going on and there was keen competition for skilled workmen. Another factor was that material could be used which had been bought when prices were low. There were two alternatives, either a PANDORA (later KATOOMBA) (8 x 4.7 in, 19 knots) or a repeat 541 (25 DE MAYO). The advantage of the PANDORA type was that less money would be expended and there would be a better chance of selling her to the Admiralty. On the other hand the 541 type had very attractive features with almost as high speed as PIEMONTE but with a more powerful armament, better protection and a larger coal supply. Watts concluded; "the performance of the PIEMONTE has increased the demand for vessels possessing such features. In each of our stock vessels - DOGALI, PIEMONTE, and 541 - our aim has been to achieve exceptionally high speed and I recommend this policy be continued".

Armstrong's directors endorsed the laying down of the stock ship in March 1891; in May 1892 she was offered to, and accepted by, Argentina. After launching the size of her torpedo tubes was increased to 18 in. The Argentine government did not request FD trials, but at the end of a hard days steaming, this was tried out at Armstrongs request.



NUEVE DE JULIO on final trials off the Tyne, January 1893, in the handsome white and buff livery worn by the Argentine Navy at the end of the last century. Note that her foretopmast is housed. Photo : Vickers

Career

She was discarded 23 October 1930 after a career that was uneventful, apart from helping to put down a rebellion in 1893, by capturing the rebel held torpedo boat base at Tigre upstream from Buenos Aires.

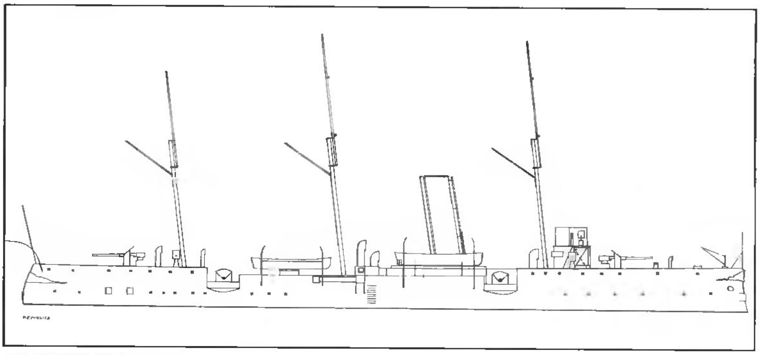
REPUBLICA

ex QUINZE DE NOVEMBRO ex REPUBLICA

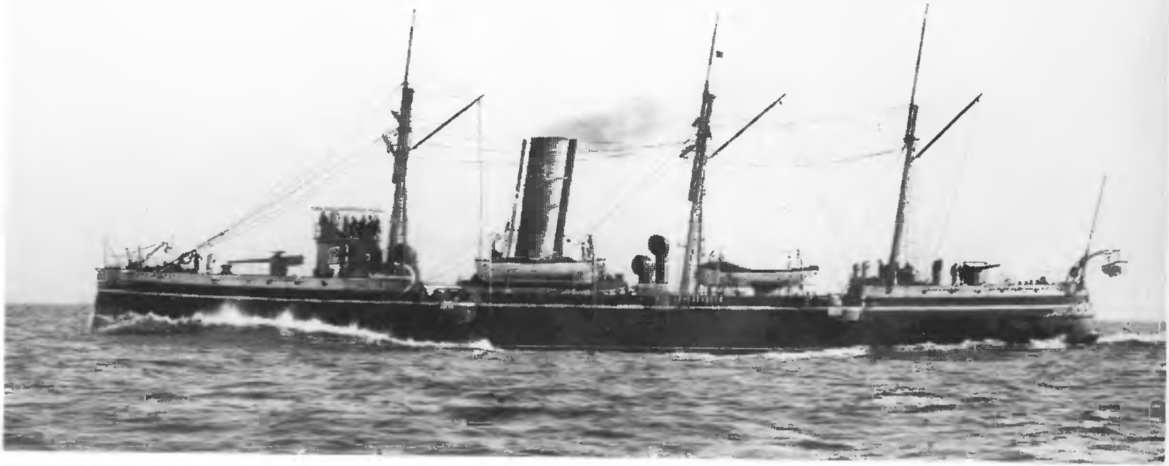
Brazil

Yard & No	Laid down	Launched	Final trials	Designer
Elswick 589	July 1891	26 May 1892	24 Nov 1892	Phillip Watts

Displacement	1314 tons. 1260 tons on trials.
Dimensions	210 (226 ft 6 in oa) x 35 x 12 ft 9 in [64 (69.04 oa) x 10.6 x 3.9]. Freeboard amidships 7 ft 3 in.
Armament	6 x 4.7 in QF, 4 x 6 pdr QF, 6 mg. 4 x 14 in TT.
Armour	Deck: slopes 2 in, flats 1 in. CT 3 in.
Machinery	2 sets VTE by R & W Hawthorn Leslie. 4 Navy boilers. Designed IHP ND 2000 = 16 knots, FD 3300 = 17 knots. Trials IHP FD 3807 = 17.39 knots.
Fuel	Coal. 100 tons normal, 416 tons maximum.
Complement	160.



REPUBLICA 1892



REPUBLICA running trials off the Tyne before acceptance, autumn 1892 Photo: Vickers archive CUL

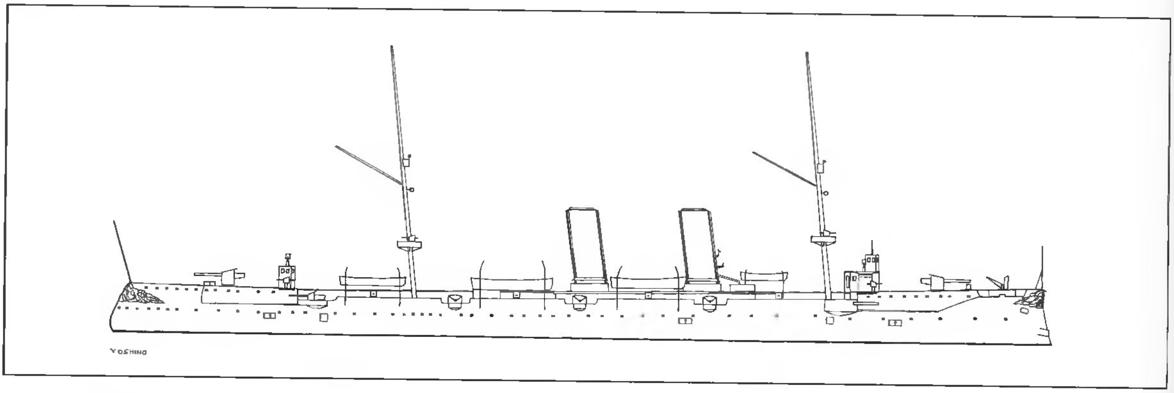
General

Designs both for REPUBLICA and the smaller cruiser TIRADENTES (see under small cruisers in Chapter 8) were submitted in March 1890, accepted in May and orders were placed in July 1891 with REPUBLICA being laid down in the same month. By the end of November 1892 work was complete except for the torpedo tubes which were to be supplied by the French firm Canet. She left the Tyne in January 1893. She was little larger than a 1st class gunboat with a barque rig which was soon reduced to three bare poles.

Career

In the turmoil after the deposition of Emperor Pedro II in 1890, REPUBLICA in 1894 captured a merchant vessel, the JUPITER, which had been commandeered by mutineers. At the outset of the civil war in September 1894 she jointed the insurgents led by Admiral Mello. She rammed and sank the government transport RIO DE JANEIRO, which was carrying 1100 men, took part in the capture of Santa Catharina and just before the collapse of the rebellion had a successful action with a government gunboat CANANEA which eventually ran aground. REPUBLICA was renamed QUINZE DE NOVEMBRO after the war but reverted to her original name in about 1900.

REPUBLICA served as a mine layer for some years. In about 1909 her main mast was removed. In World War One she formed part of the Northern Division patrolling the coast of Brazil. She was scrapped in about 1925.

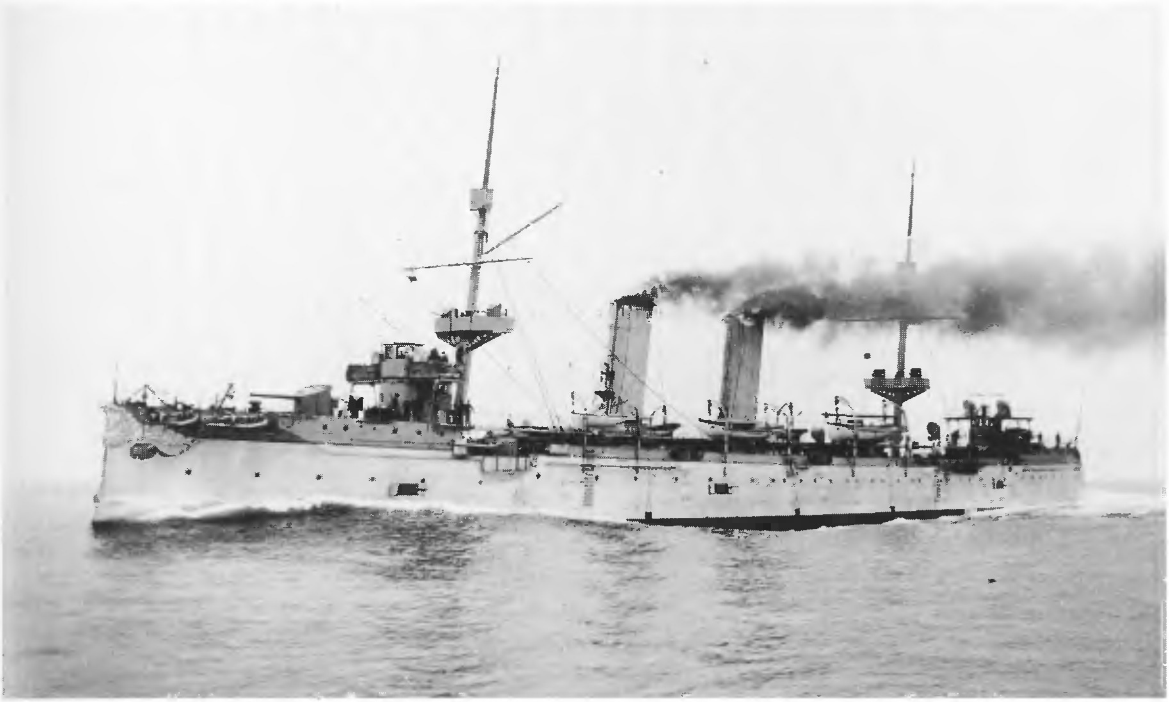


YOSHINO 1893

YOSHINO
Japan

Yard & No	Laid down	Launched	Completed	Designer
Elswick 596	Jan 1892	20 Dec 1892	July 1893	Phillip Watts

Displacement	4158 tons 4180 tons on trial.
Dimensions	360 (388 oa) x 46 ft 6 in x 17 [109.7 (118.26 oa) x 14.2 x 5.2] Freeboard amidships. 11 ft 7¼ in.
Armament	4 x 6 in 40 cal QF, 8 x 4.7 in 40 cal QF, 22 x 3 pdr QF, 5 x 18 in TT
Armour	Deck: slopes 4½ in - 3½ in, flats 1¾ in. CT 4 in.
Machinery	2 sets VTE by Humphrys Tennant. 12 single-ended boilers. Designed IHP ND 10,000 = 20 knots, FD 15,750 = 22.5 knots. Trials IHP ND 10,320 = 21.614 knots, FD 15,818 = 23.031 knots.
Fuel	Coal. 350 tons normal, 1016 tons maximum.
Complement	390



YOSHINO running trials off the Tyne, July 1893. The bulwark plates for her upper deck 6 in guns are lowered, and the ports for the hull-mounted 3 pdrs open. Note how the forward 3 pdr is almost flooding even in a flat calm!

Photo : NCL

General

In 1891 an invitation to tender for a 4200 ton cruiser was received from Japan and in November the design submitted by Armstrongs was accepted with modifications. Larger than any of her predecessors, the double bottom was complete in this and all subsequent Elswick cruisers. YOSHINO had a raft body between the protective and lower decks of about 3 ft depth so her freeboard amidships was 11 ft 6 in. This necessitated increased beam and consequently she displaced 600 tons more than the NUEVE DE JULIO. She may be seen as a culmination of the forecastle and poop design and was followed by two near sisters, TAKASAGO and CHACABUCO. One curious arrangement, never repeated, was that six 3 pdrs on each broadside fired through lower deck ports about 7 ft above the waterline. The theory behind this was that such a low command would maximise the chance of hitting attacking torpedo craft at short range, but the guns were unusable in any but the calmest sea. On trials she made 23 knots with forced draught and was for a time the world's fastest cruiser.

Career

She sailed for Japan on 8 October 1893. During the Sino-Japanese war of 1894-1895 YOSHINO was the flagship of Admiral Tsuboi's "Flying Squadron", and led it in its flanking move round the right of the Chinese line at the Battle of Yalu. Her quick-firing armament was highly effective, aided by the fact that she was the only warship on either side to use smokeless powder. She helped sink or disable a number of Chinese ships including three Armstrong-built ones, CHIH YUEN, CHA'O YUNG and YANG WEI. She suffered no damage during the battle. YOSHINO was later one of the blockading squadron at Wei-Hai-Wei and was struck once by a ricochet shell, sustaining seven casualties. During the siege of Wei-Hai-Wei the Chinese torpedo boats attempted to escape, and were hotly pursued by Tsuboi's squadron with YOSHINO leading and eventually all the torpedo boats were run aground. During the war she went aground for 24 hours in Roby channel in the Formosa straits, but was refloated suffering no significant damage.

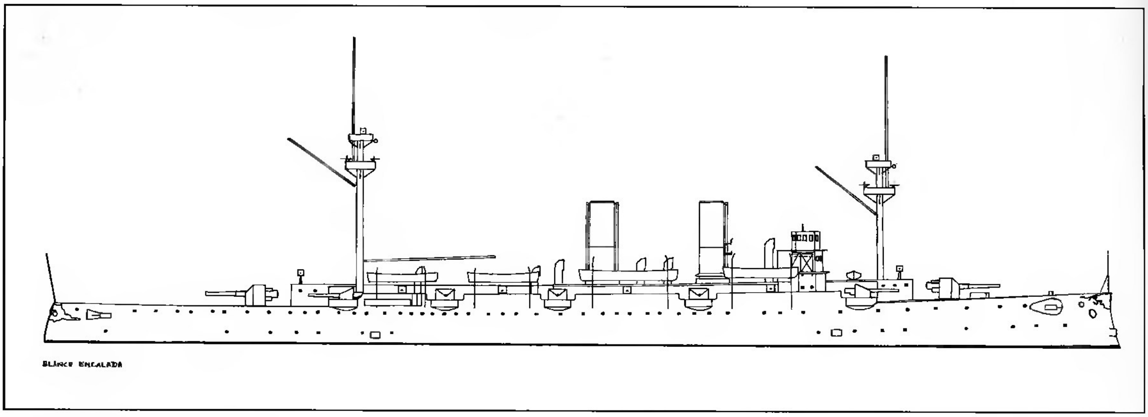
In the Russo-Japanese war YOSHINO formed part of the Third Division, and took part in the blockade of Port Arthur. On 15 May 1904 while cruising in company off Port Arthur in thick fog, and during an alteration in course, she was struck on the port side, just abaft the engine room, by KASUGA. She took a very heavy list to starboard, so much so as to submerge the starboard side of the poop. (The list to starboard was the opposite to what would normally have been expected but is well attested.) Attempts were made to place a collision mat over the hole, with the consequence that although most of the boats on the lee side were got out, they were not manned. All the lee boats were destroyed by masts and davits when YOSHINO went down, and there were fewer than 100 survivors, most of whom got away in a cutter launched from the weather side, while others were picked from the water by her consorts.

BLANCO ENCALADA

Chile

Yard & No	Laid down	Launched	Final Trials	Designer
Elswick 605	Aug 1892	9 Sep 1893	29 May 1894	Phillip Watts

Displacement	4403 tons. 4568 tons on trials.
Dimensions	380 (398 oa) x 45 ft 9 in x 18 ft 5 in [112.78 (121.3 oa) x 13.94 x 5.62] Freeboard amidships 13 ft 6 in.
Armament	2 x 8 in 40 cal, 10 x 6 in 40 cal QF, 12 x 3 pdr QF, 10 x 1 pdr QF, 2 Gatling mg. 5 x 18 in TT aw, 1 bow fixed, 4 broadside training.
Armour	Deck, slopes 4 in - 3 in, flats $1^{3}/_{4}$ in. CT 6 in. 8 in gunshields: 6 in fronts, 2 in sides; 6 in gun shields: 2 in.
Machinery	2 sets VTE by Humphrys Tennant. 4 double-ended boilers. Designed IHP ND 9500 = 20.25 knots. FD 14,500 = 22.5 knots Trials IHP ND 11,279 = 21.75 knots. FD 14,500 = 22.78 knots.
Fuel	Coal. 350 tons normal. 866 tons maximum.
Complement	300



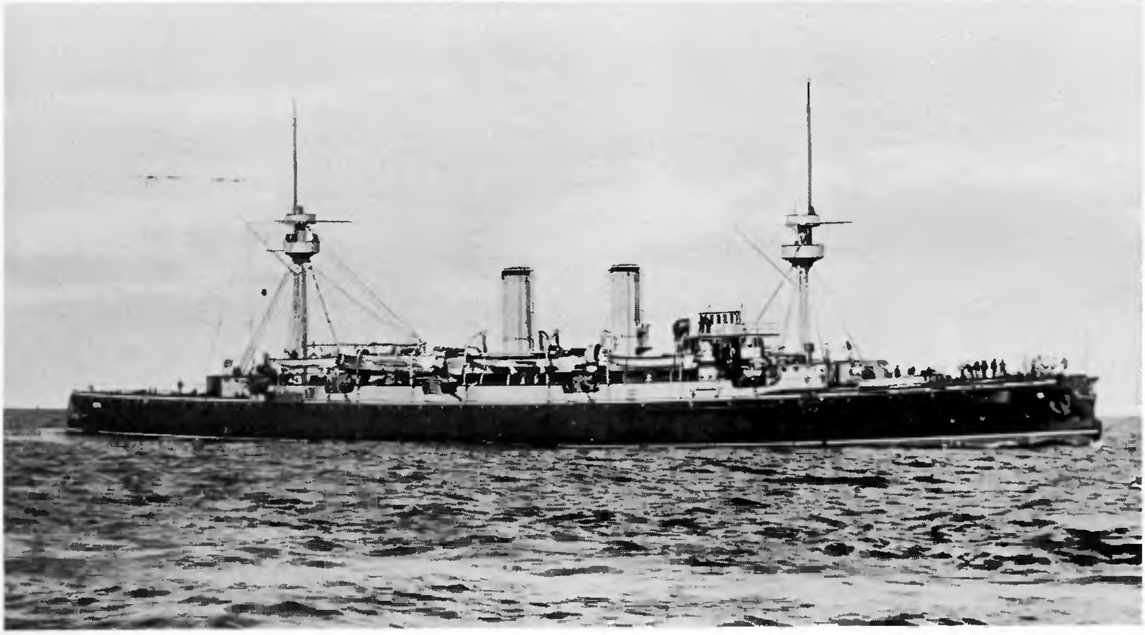
BLANCO ENCALADA 1894

General

In July 1892 Armstrongs were asked by the Chilean government to submit designs and specifications for a fast sheathed cruiser of 4300 tons. While waiting for confirmation and in order to keep the yard fully employed, the firm laid down a stock cruiser to the design submitted to Chile in the September. She was taken up by Chile two months later at a price of £333,500. The Chilean commission and their adviser, Sir Edward Reed asked for a considerable number of costly modifications. She was sheathed and coppered. From the PIEMONTE on, Elswick cruisers had been built with a midships freeboard ranging from 8½ to 11½ ft, with reasonable freeboard fore and aft being provided for by forecastle and poop. The BLANCO ENCALADA was the first flush deck cruiser to be built since the NANIWA with 18 in less freeboard than that ship but with more sheer at the extremities and with accommodation on the lower deck forward. This arrangement was reproduced in the BUENOS AIRES, HAI CHI and HAI TIEN. The flush deck obviated the low waist of the poop and forecastle type which was forced on the designers in order to mount the largest armament possible on a small hull but which resulted in wetness amidships in anything of a sea.

The 8 in guns, which were of all steel construction, fired a 210 lb projectile which could be manhandled by two men, using a carrier. Cordite was supplied by a central hoist opening on to the left side of the mounting, but the shells were either stored in racks near the gun, or brought up from the shell room by independent tube hoists.

W H White, the Director of Naval Construction at the Admiralty, made a number of critical observations in 1896, writing that the Admiralty had been offered this vessel. The provision of ammunition was much below Admiralty practice, the scantlings were lighter than normal to give a light hull, while in the engine room accessibility, the stroke of the engines and ventilation were arranged primarily to offer very high power, and not to sustain efficiency and continuous steaming.



BLANCO ENCALADA off the Tyne, May 1894 Photo : Vickers

She was a handsome ship with two well proportioned funnels with the foremast mounted forward of the bridge. Both masts had double fighting tops at the upper end of the lower mast. By 1919 her upper tops were reduced to railed platforms with canvas dodgers, her lower foretop was roofed and furnished with a fire control and a searchlight platform added low on her main mast. By 1937 all except the lower foretop of her original rig had been removed and the platform low on the main mast had been enlarged to take two search lights, one before and one aft of the mast.

Career

She had an uneventful career except on 3 September 1931 when her officers were ordered ashore by the crew and the following day she led the naval vessels from Talcahuano to join the Chilean naval mutiny at Coquimbo.

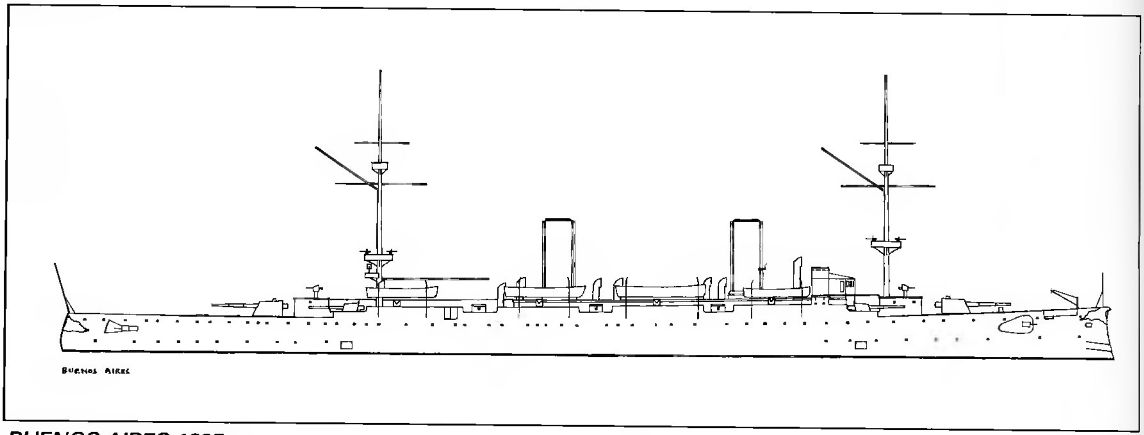
She was less heavily modified than some of the other Armstrong cruisers in Chilean service and spent her later years as a training ship. She was relegated to harbour duty in 1944 when she was hulked. She was finally discarded in 1946.

BUENOS AIRES

Argentina

Yard & No	Laid down	Launched	Final trials	Designer
Elswick 612	Feb 1893	10 May 1895	Nov 1895	Phillip Watts

Displacement	4620 tons. 4788 tons on trials.
Dimensions	396 (424 oa) x 46 ft 6 in x 17 ft 4 in [120.7 (129.2) x 14.16 x 5.45] Freeboard amidships 14 ft.
Armament	2 x 8 in 45 cal, 4 x 6 in 45 cal QF, 6 x 4.7 in 45 cal QF, 16 x 3 pdr QF, 6 x 1 pdr QF 5 x 18 in TT aw, 1 bow fixed, 4 broadside training.
Armour	Deck: slopes 5 in - 4 in - 1½ in, flat ½ in. Gunshields 4½ in. CT 6 in.
Machinery	2 sets VTE by Humphrys Tennant. 4 double-ended, 4 single-ended cylindrical boilers. Designed IHP ND 12,500, FD 17,000. Trials ND IHP 14,000 = 23.2 knots on a 12 hr run. No FD trial attempted
Fuel	Coal. 350 tons normal, 983 tons maximum.
Complement	400



BUENOS AIRES 1895

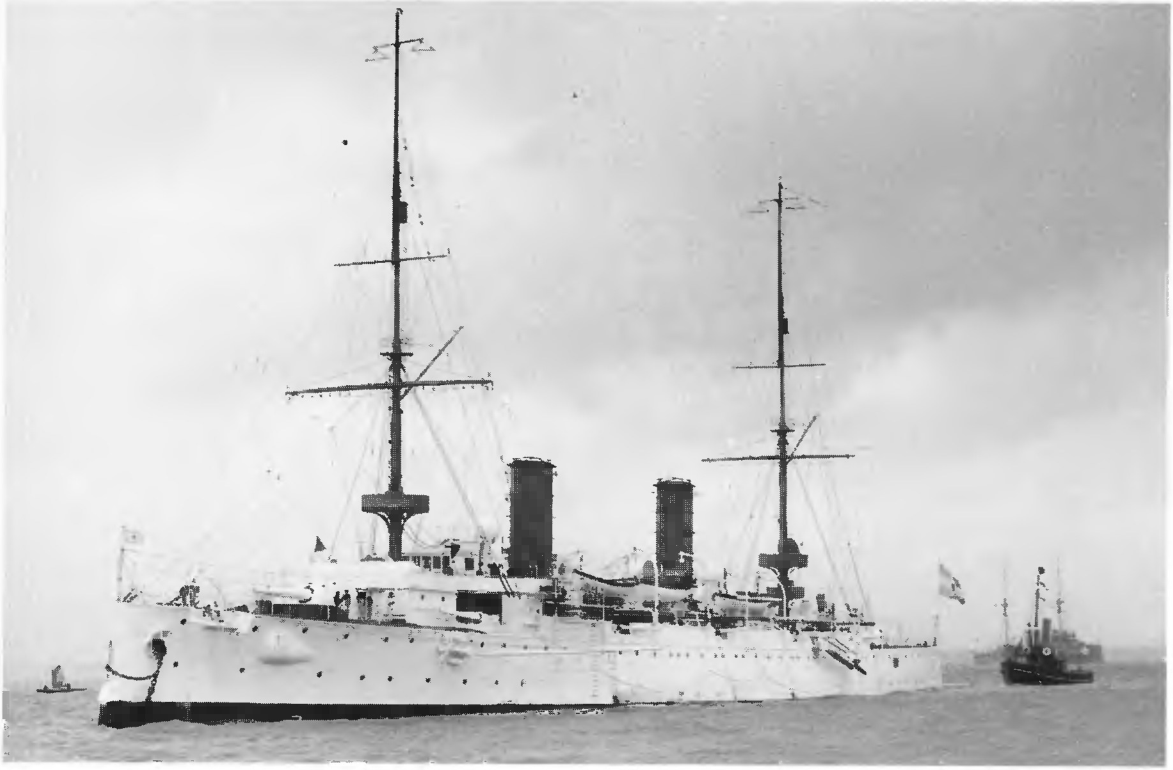
General

In January 1893 Armstrongs decided to lay down another stock ship in place of BLANCO ENCALADA, which had been sold to Chile. On 27 November, 612 was sold to Argentina and named BUENOS AIRES.

Her layout was similar to the BLANCO ENCALADA but she carried a mixed QF armament of 6 in and 4.7 in, these were of 45 calibres compared with BLANCO ENCALADA's 40 calibre 6 in. She had single fighting tops only, while her freeboard amidships was 6 in greater. The lower deck was used for accommodation both fore and aft.

Her 8 in were of 45 calibres, wire wound, electrically trained, with a breech mechanism which could open automatically by the force of the recoil. In ideal conditions a 210 lb projectile could be fired every 15 seconds as compared with the 20 seconds for the BLANCO ENCALADA's 8 in. The 45 calibre 8 in were more powerful than the 40 calibre, with a muzzle velocity with a 210 lb shell of 2830 ft/sec, as compared with 2700 ft/sec and with a 250 lb shell, 2670 ft,sec, compared with 2355 ft/sec.

The ammunition supply arrangement for the 8 in were similar to that of BLANCO ENCALADA. The quick firing guns had 2 in armoured ammunition tubes with a hydraulic hoist mechanism. The rate of delivery was 24 per minute to all the 6 in and 50-60 rounds per minute to all the 4.7 in. Before 1911 all shields were removed from 6 in and 4.7 in guns, but they were reinstated by 1920. In the early 1920s director control tops were fitted at the tops of both lower masts, and the old forward fighting top removed.



BUENOS AIRES at King George V's Coronation Review, Spithead, June 1911 Photo : NMM N10/966

Career

She arrived at La Plata 29 April 1896. She led an uneventful life apart from taking part in the 1911 Coronation Review at Spithead. She was stricken 17 May 1932.

MINISTRO ZENTENO

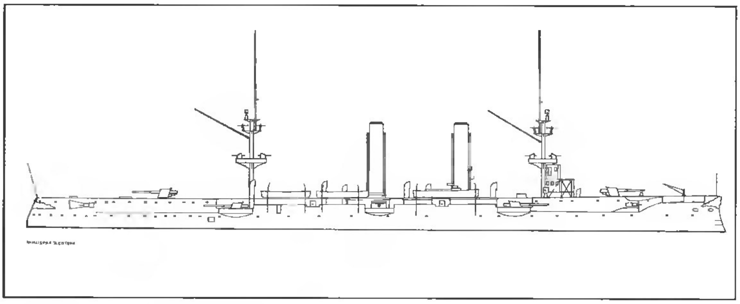
Chile

Yard & No	Laid down	Launched	Final Trials	Designer
Elswick 629	6 May 1895	1 Feb 1896	10 Jul 1896	Phillip Watts

Displacement	3437 tons. 3422 tons on trials. (Sheathed and coppered).
Dimensions	330 (354 ft 5 in oa) x 43 x 16 ft 10 in [100.6 (108.01oa) x 13.1 x 5.1]
Armament	8 x 6 in 45 cal QF, 10 x 6 pdr QF, 4 x 3 pdr QF, 4 mg. 3 x 18 in TT aw, 1 fixed bow, 2 training broadside.
Armour	Deck: slopes 1½ in, flat 1¼ in. Glacis plates 4 in. CT 4 in.
Machinery	2 sets VTE by Humphrys Tennant. 4 double-ended cylindrical boilers. Designed IHP ND 6500 = 19.5 knots, FD 7500 = 20.25 knots. Trials IHP ND 6517 = 20.2 knots.
Fuel	Coal. 400 tons normal, 848 tons maximum.

General

In November 1894 Brazil signed a contract for three sheathed cruisers of 3400 tons and 20 knots; they were assigned the yard numbers 629, 630 and 631. The work was not pressed on with because of delays in paying the first instalment, and in September 1895 No 629 was sold to Chile and given the name of CHACABUCO, but when launched was christened MINISTRO ZENTENO.

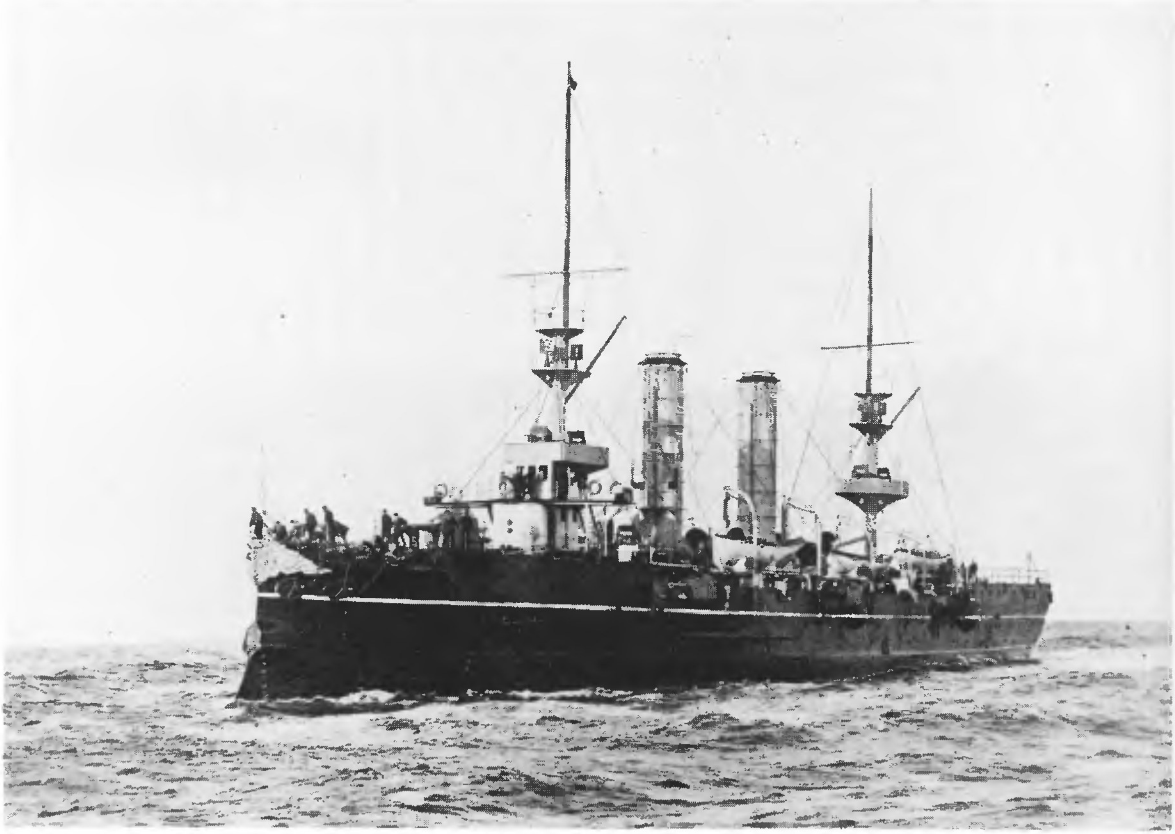


MINISTRO ZENTENO 1896

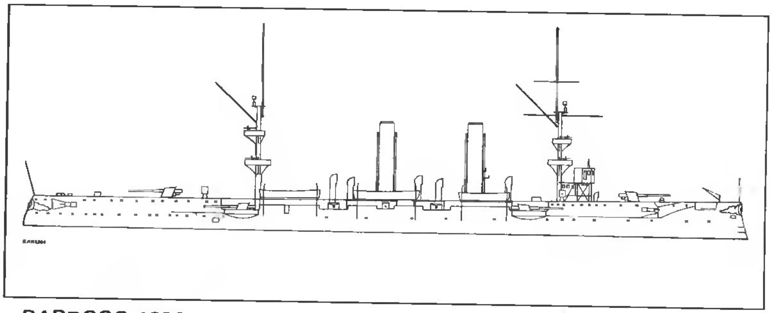
On paper, she was very powerful for her size, with a broadside of five 6 in guns, a speed of 20 knots and an excellent coal capacity. In service however her sustained sea speed could have been little better than 17 knots; because she lacked the coal filled raft body, which had been a feature of Armstrong cruisers since YOSHINO, her freeboard midships was 2½ ft less, her protection was reduced, and the coal bunkers intruded into the already cramped crew space. Too much was attempted on a limited displacement to produce a satisfactory ship.

Career

MINISTRO ZENTENO sailed from Devonport for Chile 27 March 1897. In February 1899, she formed part of the Chilean squadron taking part in the celebration of reconciliation between Argentina and Chile, following acceptance of arbitration by Great Britain over the disputed southern boundary between the two nations. From 1923 she acted as a surveying ship. She was scrapped in 1931.



MINISTRO ZENTENO on builders trials, 1896. Note the small, flat-fronted charthouse. Photo : Vickers



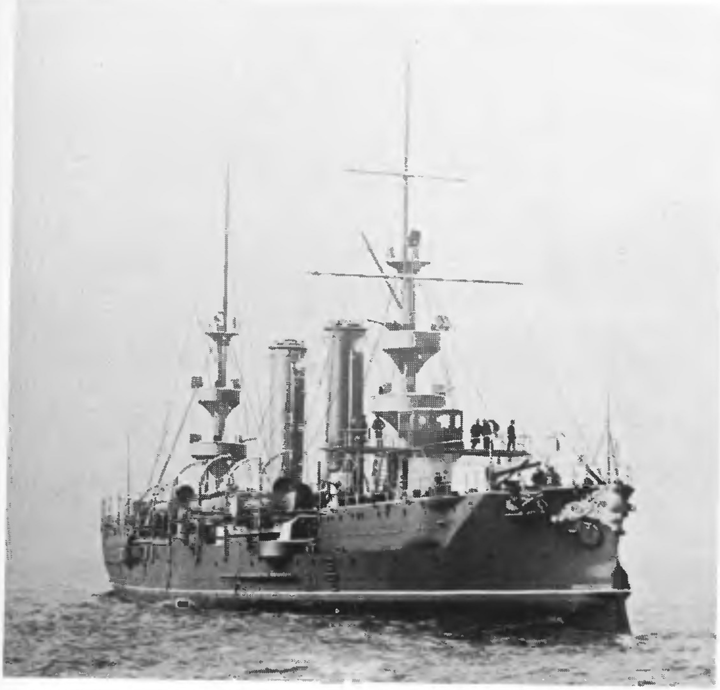
BARROSO 1896

BARROSO

Brazil

Yard & No	Laid down	Launched	Final Trials	Designer
Elswick 630	31 Aug 1895	25 Aug 1896	29 Apr 1897	Phillip Watts

Displacement	3438 tons, 3409 tons on trials. sheathed and coppered
Dimensions	330 pp (354 ft 9 in oa) x 43 x 16 ft 10 in [100.6 pp (108.01 oa) x 13.1 x 5.1].
Armament	6 x 6 in 50 cal QF, 4 x 4.7 in 50 cal QF, 10 x 6 pdr QF, 4 x 1 pdr (37 mm) Maxim - Nordenfelt automatic guns (pom-poms). 4 mg. 2 field guns. 3 x 18 in TT aw, 1 bow, two training broadside.
Armour	Deck: slopes 2 in, flats 1¼ in. 5 in glacis plates to engine cylinders. 4 in CT.
Machinery	2 sets VTE by Humphrys Tennant. 4 cylindrical boilers. Designed IHP 7,500 = 20 knots FD. Trials IHP ND 6100 = 19.52 knots, FD 7520 = 20.5 knots.
Coal	400 tons normal, 808 tons maximum.



BARROSO on trials in 1897. Note her facetted charthouse front and her round lower tops in contrast to MINISTRO ZENTENO.
Photo : Author's collection

General

At the time of the launch of MINISTRO ZENTENO the Brazilians had paid the first instalments on their remaining two ships and 631 was laid down on the slip vacated by that ship. The Chilean ship had been given the armament as designed but 630 was held up for several months while the Brazilian authorities considered various alternatives. In June they decided on a mixed armament of 6 in and 4.7 in guns for their three ships and work went ahead. The third Brazilian cruiser, with a works number 676 was not laid down until December 1897, on the slip vacated by the launch of the HAI TIEN.

As built BARROSO had two tops and a searchlight platform on each mast. In 1915-16 she was refitted when her lower tops were reduced to platforms and the after upper tops removed. Fire controls were never fitted and gunfire was controlled by voice pipe throughout her life.

Career

In World War One she formed part of the southern division of the Brazilian coast patrol. During the short- lived naval mutiny of 1924, BARROSO remained loyal. She was discarded about 1931.

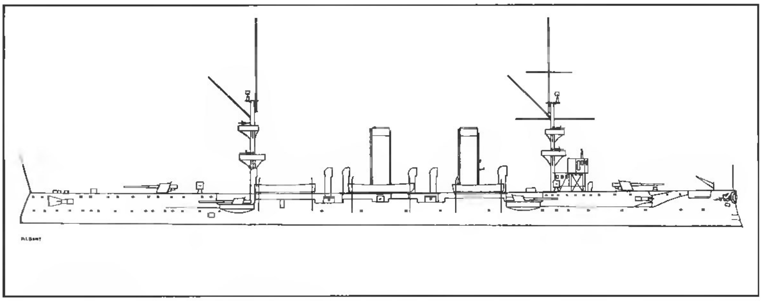
NEW ORLEANS ALBANY

ex AMAZONAS

United States of America

Yard & No	Laid down	Launched	Final Trials	Designer
NEW ORLEANS				
Elswick 631	6 Feb 1896	4 Dec 1896	19 Aug 1897	Phillip Watts
ALBANY				
Elswick 676	6 Dec 1897	14 Jan 1899	9 Jan 1900	Phillip Watts

Displacement	3438 tons. (sheathed and coppered).
Dimensions	330 (354 ft 5 in oa) x 43 x 16 ft 10 in [100.6 (108.1 oa) x 13.1 x 5.1]
Armament	6 x 6 in 50 cal QF, 4 x 4.7 in 50 cal QF, 10 x 6 pdr QF, 4 x 1 pdr pom pom, 4 x 1 pdr QF, 4 x 0.30 in Colt mg. 3 x 18 TT bow 2 broadside.
Armour	Deck: slopes 3½ in, flats 1½ in. Glacis plates 4 in. CT 4 in.
Machinery	2 sets VTE by Humphrys Tennant. 4 cylindrical boilers. Designed IHP ND 6500 = 19 knots. FD 7500 = 20 knots. Trials IHP ND 6100 = 19.52 knots. FD 7520 = 20.5 knots.
Fuel	Coal. 400 tons normal. 808 tons maximum. (ALBANY 350 tons normal. 1135 tons maximum).
Complement	22 officers, 42 marines, 301 ratings. Designed for a complement of 260.

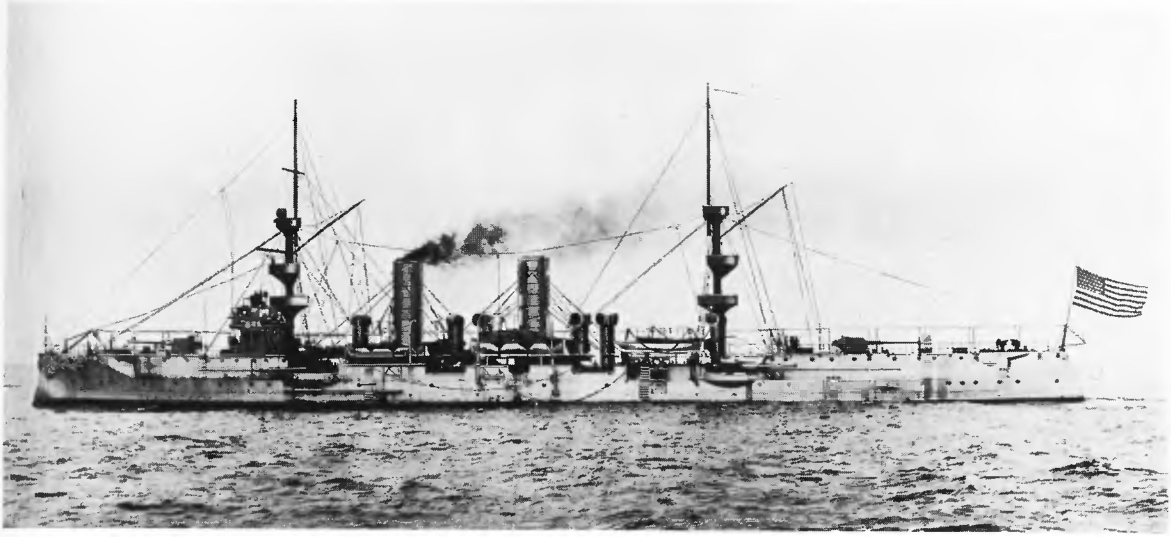


ALBANY as delivered, 1900

General

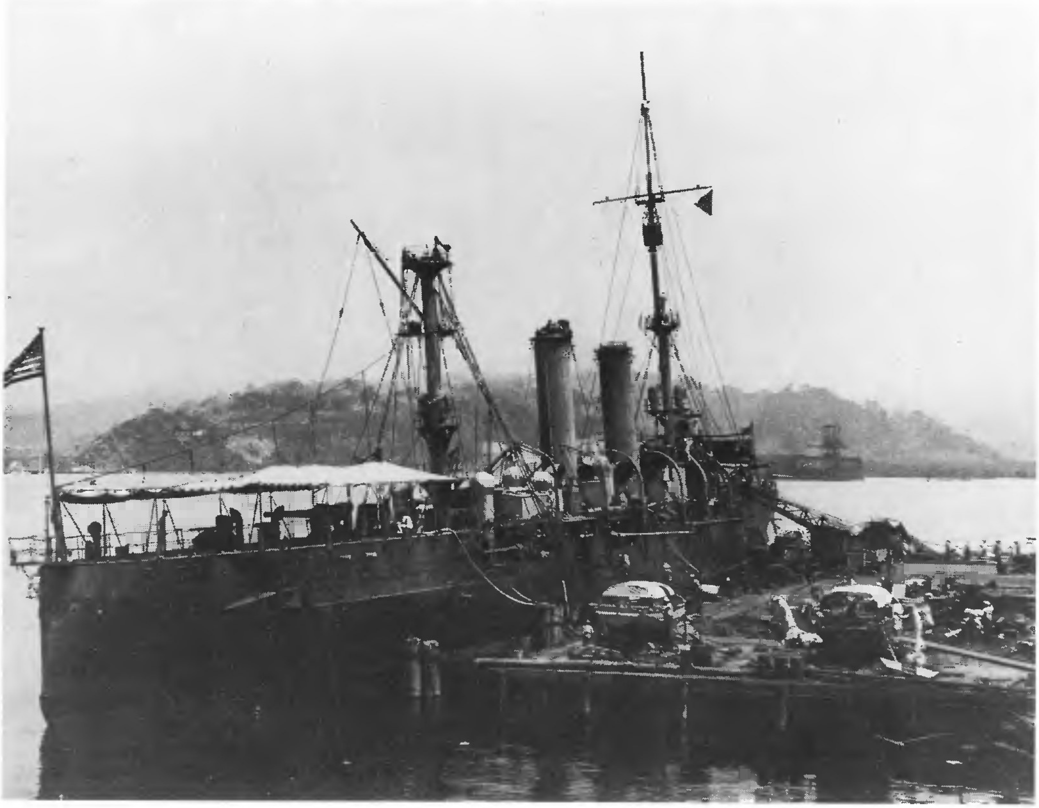
NEW ORLEANS was laid down as the third of the Brazilian batch of cruisers and was launched as AMAZONAS. She left the Tyne for Gravesend on 3 March 1898, and was sold by Brazil 16 March 1898 to the United States of America, which was then in the middle of a diplomatic crisis with Spain; she was commissioned into the United States Navy as USS AMAZONAS two days later with a scratch crew supplied by the USS SAN FRANCISCO, and was recommissioned in New York as USS NEW ORLEANS.

NEW ORLEANS attracted much criticism from her new owners. Complaints included: inadequate ventilation of magazines and wardroom: dangerous and slow electrical hoists which had to be replaced by hand operated whips, although later a request was made for mechanical hoists to be reinstated. Many other requests, mostly small, were made. After the end of the Spanish-American war NEW ORLEANS entered the New York Navy Yard for a general overhaul. Work was completed by May 1899. Adverse reports were still made, particularly the intrusion of bunkers into the berth deck, with the roof being within 3½ ft of the spar deck above, and extending 9½ ft inboard. It was recommended that these bunkers be cut down almost to deck level, the reduction in bunker capacity being almost 100 tons, after some oil tanks had been converted to coal bunkers. Most damning was a report based upon inclining experiments alleging that at minimum stability her metacentric height was –0.48ft. This prompted a rebuttal from Armstrongs, and it turned out that the New York Navy Yard inclining experiments were quite invalid.



ALBANY off the Tyne at acceptance, early in 1900. Note that her funnels are thicker and lower than those of BARROSO and NEW ORLEANS Photo : Vickers archive, CUL

In January 1896 designs were submitted to Brazil for a second class cruiser of 4500 tons to replace MINISTRO ZENTENO but eventually this ship, which was originally named ALMIRANTE ABREU, was built as a sister to 630 and 631. She was bought by the United States in March 1898 and christened ALBANY. Her trials were complete by January 1900 and she left the Tyne on 9 June that year.



NEW ORLEANS refitting at Olongapo, in the Philippines, about 1912 Photo : USN

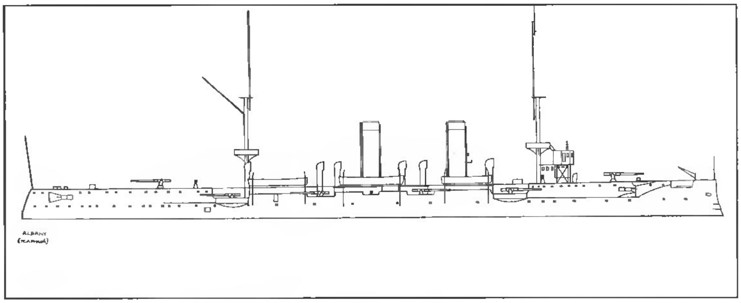
Careers

NEW ORLEANS

She formed part of Commodore Schley's Flying Squadron off Santiago de Cuba, but missed the battle of July 3rd having gone to Key west to refuel; she subsequently took part in the blockade of Cuba until the war ended. After her first refit she joined the Asiatic Fleet where she was flagship of the cruiser squadron. She returned to the USA for a major refit and was out of commission from 1905-9, work proceeding at a liesurely pace. She was then rearmed with 10 x 5 in RF in place of her 6 in and 4.7 in QF. Her tertiary armament was changed from 6 pdrs to 3 pdrs and both upper fihting tops were removed at the same time. In 1910 NEW ORLEANS returned to the Orient for three years, then patrolled the Mexican west coast during the US-Mexican crisis. During World War I she took part in convoys between the United States and Europe. In 1919, 1920 and 1922 she was based at Vladivostok. She returned to the USA in 1922, decommissioned, was struck from the Navy list in 1929 and was sold for scrapping 11 February 1930.

ALBANY

Her completion was delayed by a fire in the Elswick works, when a 4.7 in gun mounting and dynamos were destroyed. She served as part of the Asiatic Fleet from 1900-04 and was then refitted over the next three years, being given a uniform armament of 5 in RF instead of her 6 in and 4.7 in QF. Served in the Asiatic Fleet from 1910-13, took part in the operations against Mexico, trained naval militia and was Flagship, Squadron 6, Patrol Force, Atlantic Fleet. After America's entry into World War One she became part of the cruiser force, Atlantic Fleet, escorting convoys until the end of the war, when she took part in the occupation of Vladivostok 1919-20. She was decommissioned in 1922 and sold for scrapping on 11 February 1930.



ALBANY re-armed and with tops reduced, 1908

PACTOLUS

Great Britain

Yard & No	Laid down	Launched	Final trials	Designer
Elswick 657	May 1896	21 Jan 1897	15 Sep 1898	DNC

Displacement	2126 tons normal. 2178 tons on trials.
Dimensions	300 (313 oz) x 36 ft 6 in [91.4 (95.4 oa) x 11.1 x 4.1].
Armament	8 x 4 in QF, 8 x 3 pdr QF, 3 mg, 2 x 18 in TT.
Armour	Deck: slopes 2 in-1 in-3/4 in, flats 1 in- 3/4 in-1/2 in. CT 3 in.
Machinery	2 sets VTE by J Penn. 8 Blechynden boilers. Designed IHP ND 5000 = 18.5 knots, FD 7000 = 20 knots. Trials IHP ND 5428 = 19.1 knots, FD 7201 = 20.5 knots.
Fuel	Coal. 504 tons maximum.
Complement	224

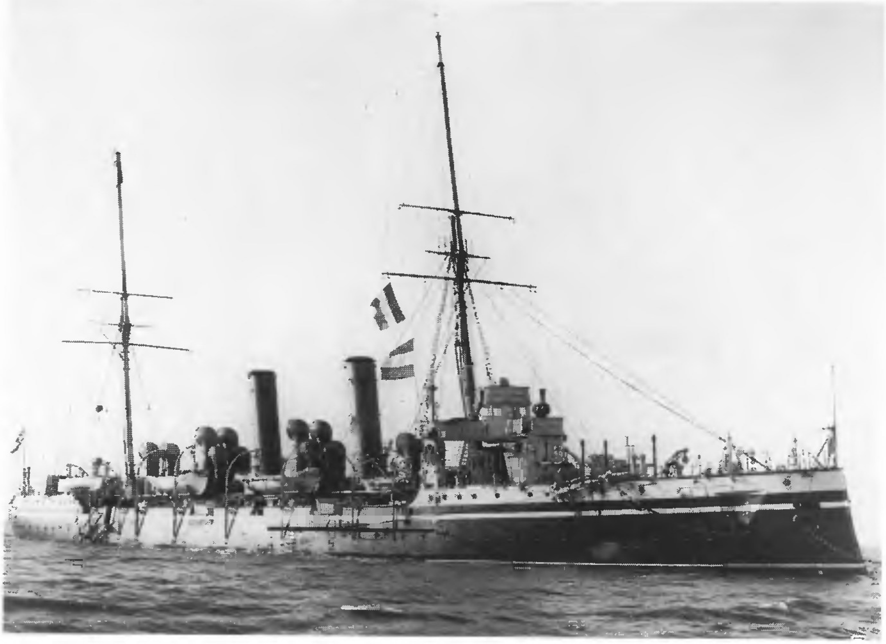
General

PACTOLUS belonged to the PELORUS class of third class cruisers which were longer, lighter and faster developments of the PEARLs and armed with 4 in guns instead of 4.7 in. When the class were being built the Navy's Engineer in Chief was experimenting with a wide range of water-tube boilers many of which gave much trouble. The Blechynden boilers fitted to PACTOLUS and POMONE were particularly unsatisfactory and both ships were relegated to subsidiary service earlier than their sisters.

The armament was sided with two 4 in guns each on the forecastle and poop and four in the waist. Freeboard amidships was 6 ft 2 in.

Career

Channel Fleet 1899-1903. Laid up from 1904 and then converted to a submarine dept ship in 1912. During World War One she served with the 9th Submarine Flotilla. Sold on 25 October 1921 to the Multilocular Shipbreaking Co. Stranraer, for scrapping.



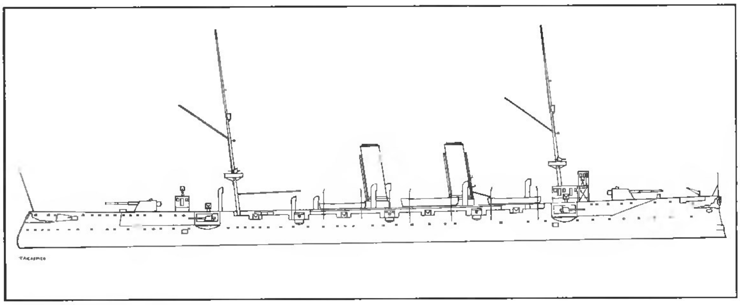
PACTOLUS in full Victorian livery about 1900 Photo : IWM RP1230

TAKASAGO

Japan

Yard & No	Laid down	Launched	Final trials	Designer
Low Walker 660	2 Apr 1896	18 May 1897	6 April 1898	Phillip Watts

Displacement	4160 tons. 4687 tons on trials.
Dimensions	360 (388 oa) x 46 ft 6 in x 17 [109.7 (118.2 oa) x 14.2 x 5.2]
Armament	2 x 8 in 45 cal, 10 x 4.7 in QF, 10 x 12 pdr QF, 6 x 2½ pdr QF. 5 x 18 in TT aw. 1 bow fixed, 4 broadside training.
Armour	Deck: slopes 4½ in-3½ in, flats 1¾ in. CT 4 in.
Machinery	2 sets VTE by Humphrys Tennant. 4 double-ended, 4 single-ended cylindrical boilers. Designed IHP ND 10,000 = 20.5 knots, FD 15,750 = 22.5 knots. Trials ND 22.22 knots, FD 22.9 knots.
Fuel	Coal. 350 tons normal, 1028 tons maximum.
Complement	405



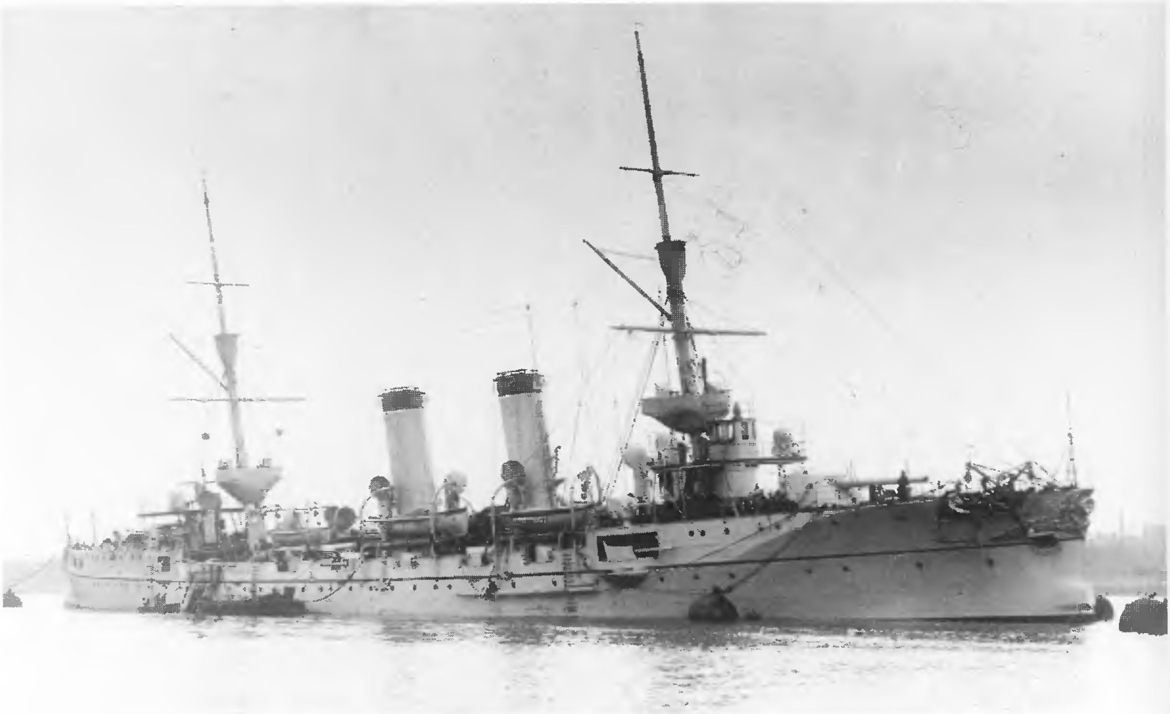
TAKASAGO 1898

General

A near sister of YOSHINO but with a modified armament. She was laid down as a stock cruiser at Low Walker and sold to the Japanese government in July 1896. There is much information about her dimensions and weights contained in the D'Eyncourt papers and in a lecture given by Admiral Sato, Director of the Japanese Naval Construction Corps, and published in translation in "Engineering", 12 August 1904. D'Eyncourt noted that the protective deck extended from 1 ft above to 4 ft below the load water line amidships. The tops of the bunkers were 4 ft 3 in above the water line with the upper deck 7 ft 4 in above the lower deck giving a freeboard of 11 ft 7 in. Sato records that her metacentric height was 1.8 feet and gives the following percentage weight of figures at normal coal capacity.

Hull	Equipment	Armour	Machinery	Armament & Ammunition	Coal	TOTAL
41.6%	5.7%	11.6%	24.7%	8.7%	7.7%	100.0%

Engines, boilers etc 911 tons. Boiler water 200 tons. Condenser water 9 tons. Weight of machinery in tons per IHP 0.862. 78



TAKASAGO shortly before acceptance in April 1898

Photo : UNT

Career

Sailed for Japan 25 May 1898. With ASAMA, she returned to England in 1902 to participate in King Edward VII's Coronation Review at Spithead in June. During the Russo-Japanese war TAKASAGO was one of the Third Division of the First Squadron: she took part in the blockade of Port Arthur and was present at the Battle of the Yellow Sea, 10 August 1904. She sustained no casualties during the engagement.

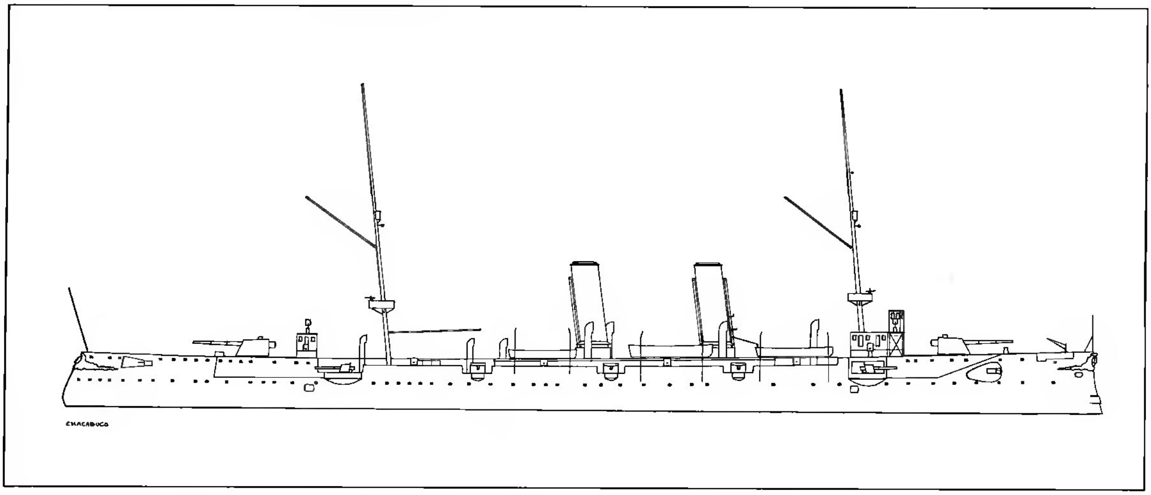
On the night of 12 December 1904, in company with OTOWA, while searching for escaping Russian vessels between Port Arthur and Chefoo, she struck a mine on the port side amidships. Water suddenly broke into two large coal bunkers and she sank so rapidly that there was no time to launch boats. OTOWA was quick to start picking up survivors but the intense cold killed so many that only the Captain, three officers and 158 men were rescued. TAKASAGO was the last vessel of any size to be lost by Japan during the war.

CHACABUCO

Chile

Yard & No	Laid down	Launched	Final trials	Designer
Low Walker 663	11 Aug 1896	4 Jul 1898	16-17 Jan 1902	Phillip Watts

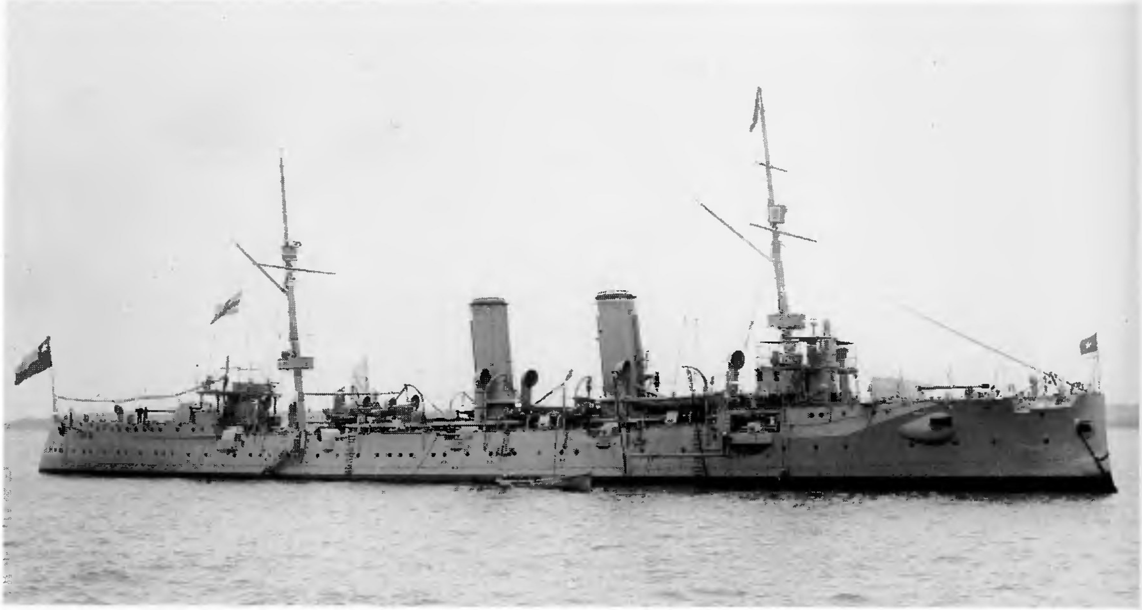
Displacement	4160 tons
Dimensions	360 (388 oa) x 46 ft 6 in x 17 [109.7 (118.2 oa) x 14.2 x 5.2]
Armament	2 x 8 in 45 cal, 10 x 4.7 in QF, 16 x 3 pdr QF, 6 x 1 pdr QF. 5 - 18 in TT aw. 1 bow fixed. 4 broadside training.
Armour	Deck: slopes $4\frac{1}{2}$ in - $3\frac{1}{2}$ in, flats $1\frac{1}{4}$ in. CT 4 in.
Machinery	2 sets VTE Humphrys Tennant. 4 double-ended, 4 single-ended cylindrical boilers. Designed IHP ND 10,000 = 20.5 knots, FD 15,750 = 22.5 knots. Trials IHP FD 16,034 = 22.92 knots.
Fuel	Coal. 350 tons normal, 1028 tons maximum.



CHACABUCO, 1902

General

This sister ship to the TAKASAGO was authorised to be laid down at the Walker Yard as a "Stock YOSHINO". She was launched on 4 July 1898, and was provisionally named FOURTH OF JULY in consequence. She was completed by night and day shifts but no explanation is given in the report book. Was she perhaps intended for the United States Navy? In January 1899 Noble was in correspondence with the Admiralty about purchasing her and a sale to Italy was proposed but an unrealistically low price offered. Japan and Turkey were other posssible buyers. She had steam trials on 4 and 6 May 1899 but her final speed and gunnery trials did not take place until after her purchase by Chile. She was sold to Chile in January 1902 and, after successfully completing gunnery and speed trials that month, left the Tyne on 29 April 1902.

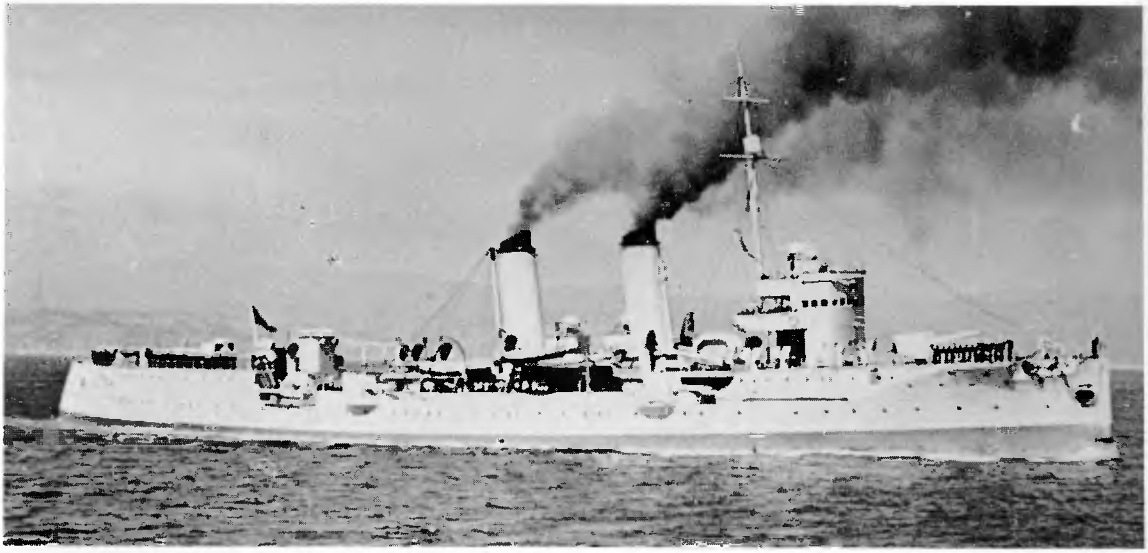


CHACABUCO at Spithead, June 1911, for King George V's Coronation Review Photo : NMM GAI-2

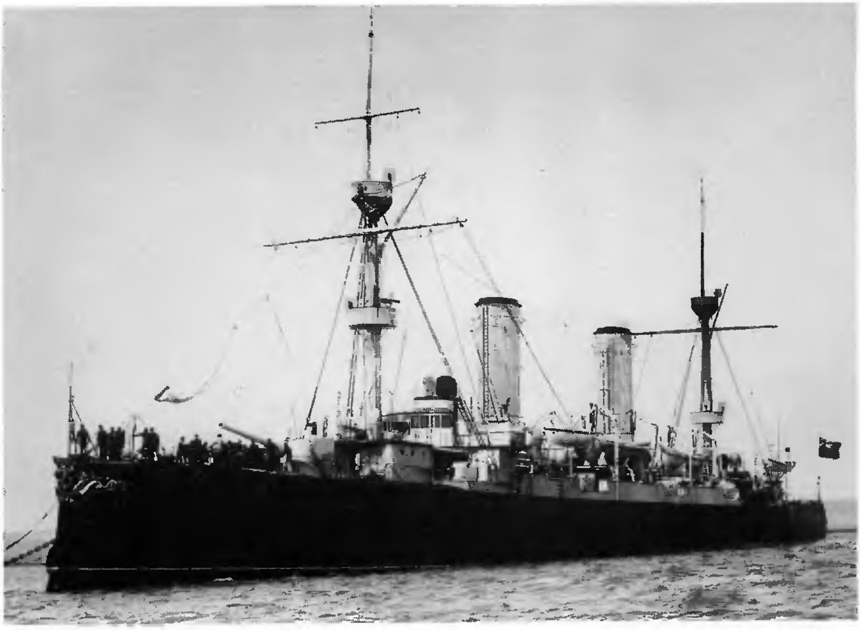
By 1919 her lower tops had been roofed and provided with fire control instruments. In 1941 she was given a major refit and emerged with a new bridge, an armament of 6 x 6 in 50 cal and 4 x 3 in AA guns, no torpedo tubes, clinker screens to her funnels and light pole masts. Late in World War Two or not long after, 10 x 20 mm AA were substituted for the 3 in. Her main mast was removed about 1950. She retained her original machinery and boilers to the end but they were well maintained by the Chileans; for example she was reported to have made 24.75 knots on a three hour trial in 1909 and was still good for 20 knots in 1950.

Career

She left the Tyne on 29 April 1902 having first attended King Edward VII's Coronation Review at Spithead, returning in 1911 for King George V's Coronation Review. Apart from these ceremonial occasions, CHACABUCO led an uneventful and long life. She was finally discarded in 1952.



New wine in an old bottle, CHACABUCO in her final state about 1950 Photo : ROM collection



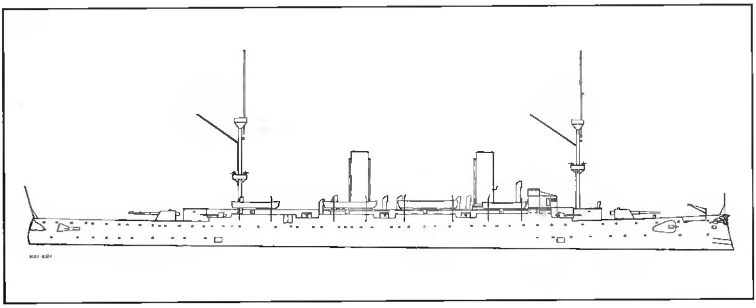
HAI TIEN, in Victorian livery but still flying the Red Ensign before delivery in the spring of 1899 Photo : IWM Q41313

HAI CHI HAI TIEN

China

Yard & No	Laid down	Launched	Final trials	Designer
HAI CHI Low Walker 667	11 Nov 1896	24 Jan 1898	10 May 1899	Phillip Watts
HAI TIEN Elswick 668	16 Feb 1897	25 Nov 1897	28 Mar 1899	Phillip Watts

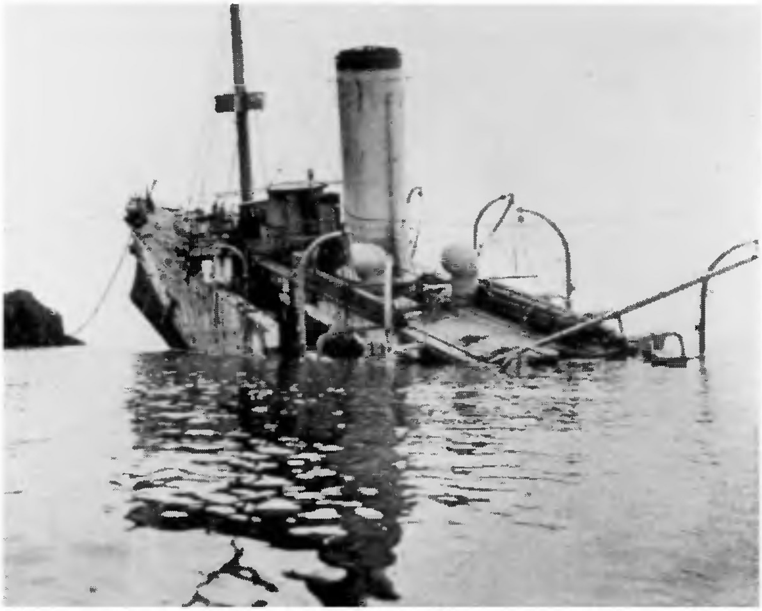
Displacement	4515 tons.
Dimensions	396 (424 *oa*) x 46 ft 6 in x 16 ft 9 in [120.7 (129.2) x 14.17 x 5.45] Freeboard: bow 20 ft 3 in, amidships 13 ft 9 in, aft 15 ft.
Armament	2 x 8 in 45 cal, 10 x 4.7 in 45 cal, 12 x 3 pdr QF, 4 x 37 mm pom poms, 6 x 11 mm Maxim mg, 5 x 18 in TT aw, 1 bow fixed, 4 broadside training.
Armour	Deck: slopes 5 in - 3 in, flats 1½ in. CT 6 in.
Machinery	4 sets VTE by R & W Hawthorn Leslie. 4 double-ended, 4 single-ended cylindrical boilers. Designed IHP ND 12,500, FD 17.000. Trials (HAI TIEN) ND= 22.64 knots, FD = 24.215 knots.
Fuel	Coal. 300 tons normal, 1000 tons maximum.
Complement	420



HAI CHI 1899

General

After the Sino-Japanese war China purchased warships both from Great Britain and Germany. The British pair were ordered by Li Hung-Chang, Armstrong's having tendered for two 2nd class cruisers of the BUENOS AIRES type in July 1896. The order was accepted later that year but it was stipulated that they were not to be sheathed. They were almost identical to BUENOS AIRES but had a uniform secondary armament of 4.7 in and had two equal sized fighting tops on each mast. HAI CHI had rudimentary fire controls fitted to her lower foretops in about 1934, but was otherwise unaltered.



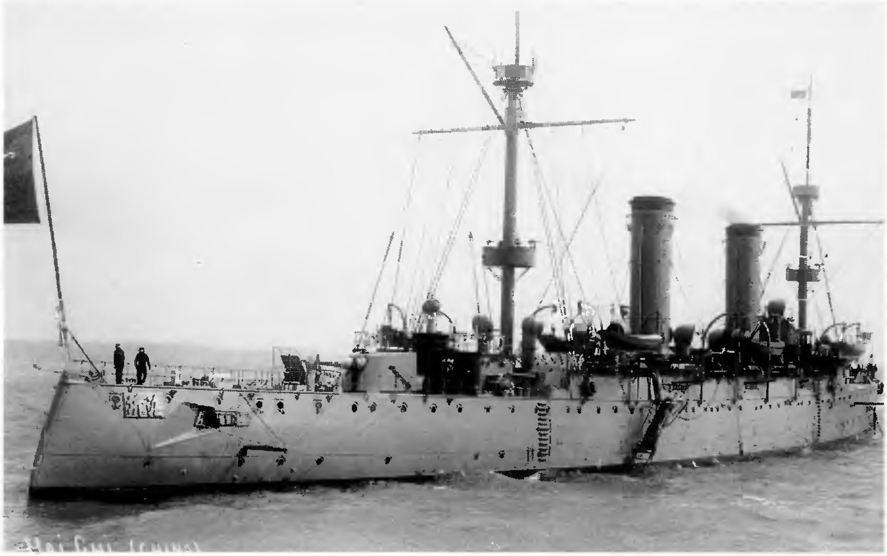
HAI TIEN wrecked and abandoned, 1904 Photo : Author's collection

Career

HAI TIEN was wrecked off Eagle Point, 60 miles from Shanghai, in April 1904. HAI CHI represented China at the Spithead review in 1911, marking the Coronation of King George V.

Because of this she missed the first stages of the revolution in China. In 1917, HAI CHI was part of the Peking Government's First Squadron of the Northern fleet but defected to the forces of Sun Yat-Sen by sailing south to Canton. After Sun Yat-Sen had been deposed as president in 1922, the HAI CHI returned north to join the Peiyang Fleet. In 1933 she again defected, going south to Canton, but returned north in 1935.

By July 1937, at the beginning of the Sino-Japanese War, HAI CHI, with other naval units, was lying at Shanghai, more or less unserviceable. On 11 August 1937 an attempt was made to block the Yangtse below Chiang-Yin (situated near the mouth on the south bank) by scuttling 7 minor warships, 28 merchant ships and a number of barges; a few days later four old cruisers, HAI CHI, HAI YUNG, HAI CHAU, and HAI SHEN were scuttled at the same point to reinforce the blockage.



HAI CHI at the Coronation Review, Spithead, June 1911 Photo : NMM GAN-2

DOM CARLOS PRIMEIRO

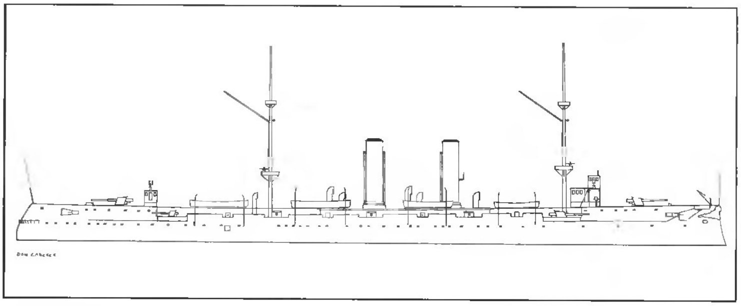
Portugal

Yard & No	Laid down	Launched	Final trials	Designer
Elswick 669	3 Dec 1896	5 May 1898	19 Apr 1899	Phillip Watts

Displacement	4253 tons. 4460 tons on trial.
Dimensions	360 (387 oa) x 46 ft 6 in x 17 ft 6 in [109.7 (117.95) x 14.2 x 5.3]. Freeboard amidships 11 ft 11 in.
Armament	4 x 6 in 45 cal QF, 8 x 4.7 in 45 cal QF, 14 x 3 pdr QF, 4 mg. 5 x 18 in TT, 2 submerged. 3 aw.
Armour	Deck: slopes 4 in - $1\frac{3}{4}$ in, flats $1\frac{1}{4}$ in. CT 4 in.
Machinery	2 sets VTE by R & W Hawthorn Leslie. Boilers 12 Yarrow water-tube. Designed IHP ND 8000 = 20 knots, FD 12,500 = 22 knots. Trials IHP ND 8000 = 20.64 knots, FD 12,684 = 22.18 knots.
Fuel	Coal. 700 tons normal, 1000 tons maximum. 944 tons carried on trials.
Complement	305

General

A tender was made to Portugal in January 1896 for a vessel similar to the YOSHINO, but to be sheathed and of smaller displacement. In July the tender was set aside and a new one asked for; this was submitted in September. In January 1897 an order was received for a sheathed cruiser of 4,100 tons. A variant on the YOSHINO, she carried a mixed 6 in and 4.7 in armament.



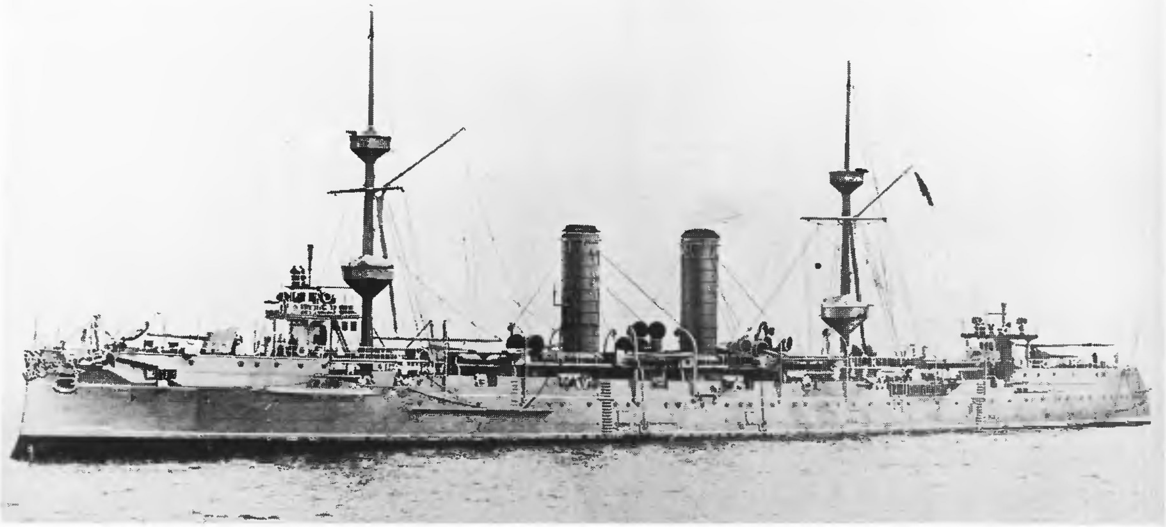
DOM CARLOS I 1899

She was the first protected cruiser type to have an all water-tube boiler arrangement, and at the time of her building she mounted the largest installation of the Yarrow type afloat. Table 3/1 shows that she carried a much greater weight of coal at normal displacement (700 tons as compared to the YOSHINO's 350 tons) so that speed, and immersion, were less affected by full bunkers.

About 1911 she was fitted with fire controls in a roofed upper fore top and both tops were removed from her main mast.

Career

DOM CARLOS I arrived in Lisbon in July 1899. She returned to Elswick in 1906 for retubing of her boilers, and repairs to her main engines, the work being satisfactorily completed in September 1907. She took a prominent part in the revolution of October 1910 which established the republic, and her name was afterwards changed to ALMIRANTE REIS.
She was dismantled in 1918 for reconstruction but Portugal's chaotic finances resulted in no progress being made and she was discarded in 1923 without ever re-commissioning.

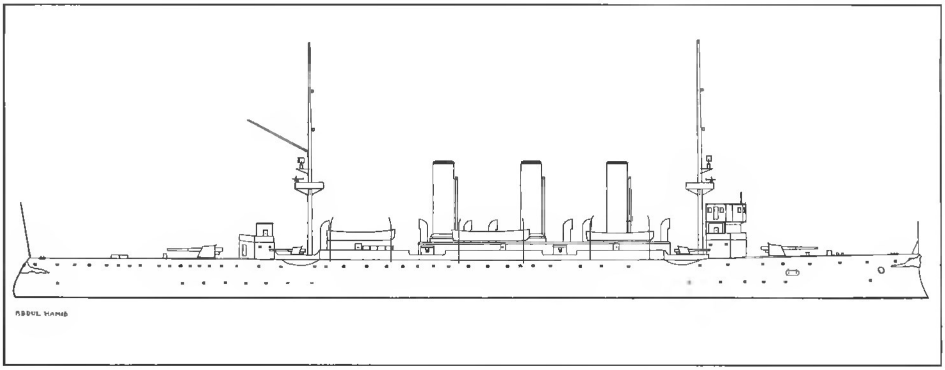


DOM CARLOS I on trials, with white sheerlines already painted up, but still with grey undercoat instead of Victorian black on her hull, Spring 1899
Photo : Vickers

HAMIDIEH
Turkey

Yard & No	Laid down	Launched	Final trials	Designer
Elswick 732	Nov 1902	25 Sep 1903	27 Apr 1904	J R Perrett

Displacement	3805 tons.
Dimensions	340 (368 oa) x 47 ft 6 in x 16 [103.6 (112.17) x 14.5 x 4.9]
Armament	2 x 6 in QF, 8 x 4.7 in QF, 6 x 3 pdr QF, 6 x 1 pdr QF, 2 x 18 in TT aw training
Armour	Deck: slopes 4 in, flat 1½ in.
Machinery	2 sets VTE by R & W Hawthorn Leslie. 4 double-ended, 2 single-ended cylindrical boilers. Trials IHP ND 9048 = 20 knots, FD 12,401 = 22.216 knots.
Fuel	Coal. 275 tons normal, 731 tons maximum. Radius 5500 miles at 10 knots.
Complement	302



HAMIDIEH 1904

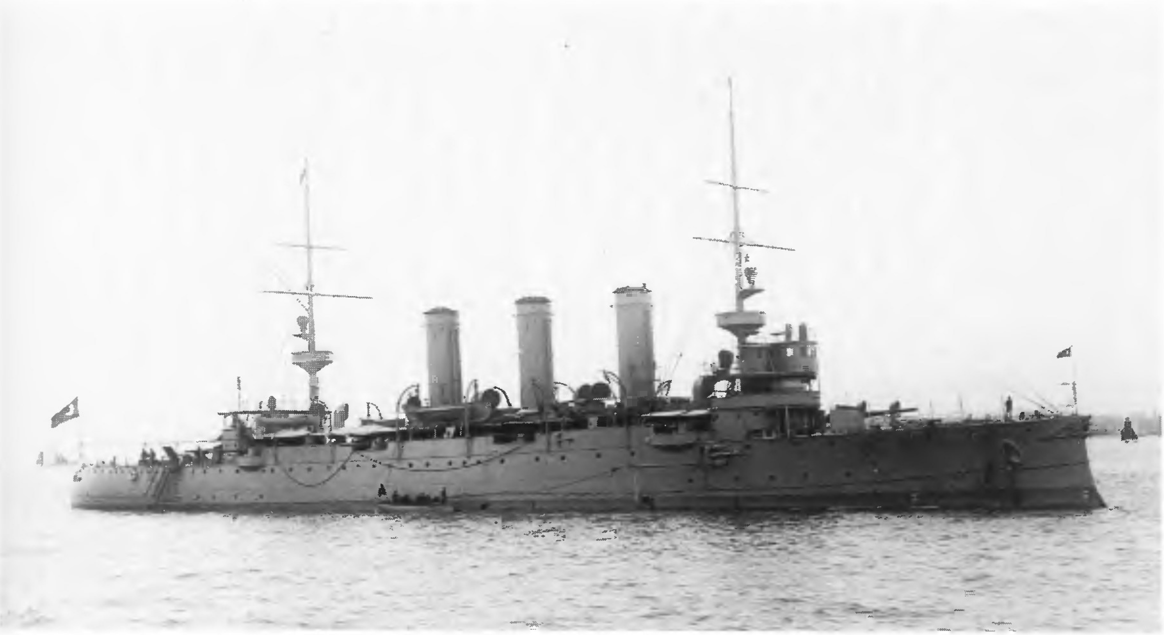
General

HAMIDIEH was ordered in July 1901, but after her keel was laid there was a delay because of non-payment of the first instalment and also because the type of boiler remained to be settled. She was J R Perrett's first warship design, and was unusual in that she was the only one of the small type of cruiser to be flush decked - thus obviating the wet waist - with a freeboard amidships of 14 feet.

In 1930 Vickers-Armstrong put forward two proposals for a major refit and modernisation :-

	Speed	Horsepower	Displacement	Fuel	Armament	Cost
Scheme 1	22.25 kts	12,500 IHP	3,600 tons	Oil for high speeds Coal for peacetime	4 x 6in, 4 x 4in AA 2 x 40mm AA 6 x 53cm TT	£325,000
Scheme 2	26 kts	40,000 IHP	3,500 tons	Oil only	4 x 6in, 2 x 40mm AA	£520,000

It was explained that, in proposal 1, part of the boiler room space would be used for a 4 in and torpedo warhead magazine. The greatly increased horespower of proposal 2 would involve using the whole boiler room space, leaving no room for the magazine, necessitating giving up the 4 in AA and the TTs; the 40 mm AA could however be increased in number. No action was taken on these proposals.

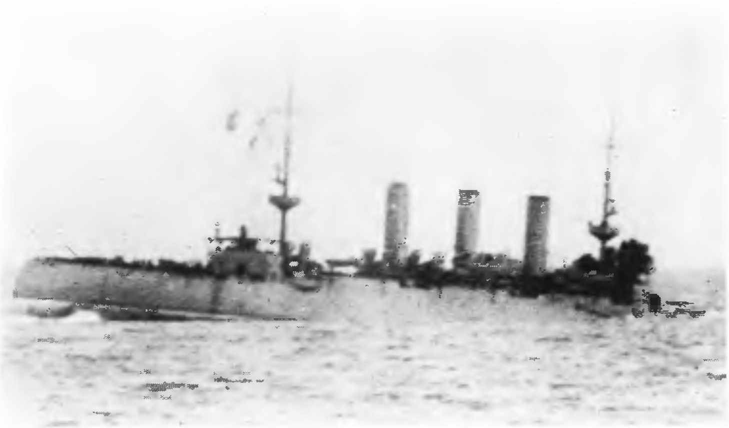


HAMIDIEH at Spithead for King George V's Coronation Review, June 1911 Photo : NMM GFR-2

Career

She took part in the Coronation Naval Review at Spithead in 1911. In the war between Italy and Turkey 1911-12 HAMIDIEH formed part of the main Turkish fleet which played no active part, not venturing out beyond the Dardanelles in face of a superior Italian force.

A few days before peace was concluded between Italy and Turkey in October 1912, Turkey found herself at war again, this time with the Balkan League of Montenegro, Bulgaria, Serbia and Greece. The disparity of naval force between Turkey and the League was much less than that with Italy, and the Turkish navy played a more active part than in the previous war. The Turkish cruisers were blockading the Bulgarian coast when in the early morning of 22 November 1912 while off Varna, HAMIDIEH was hit on the starboard side forward by an 18 in torpedo discharged by one of four attacking Bulgarian torpedo boats. The torpedo blew a hole in her starboard bow 40 ft by 20 ft but she managed to steam back to Constantinople with her fore deck submerged. That she survived is a tribute to Elswick design and workmanship as well as the crews efficient damage control.



HAMIDIEH down by the bows after being torpedoed, 22 November 1912 Photo : MPL

On 14 January 1913, after repairs, HAMIDIEH, under the command of Yüzlasi Hüseyin Rauf, slipped out of the Dardanelles straits and on the following day off the Island of Syros sank the Greek auxiliary cruiser MACEDONIA. HAMIDIEH transited the Suez Canal 21 January to the Red Sea where she achieved little, returned to the Adriatic and in March 1913 bombarded Greek troops, and damaged a Greek transport off the Albanian coast killing over 120 Serbian troops. After an engagement with a Greek gunboat off Cape Rodni, HAMIDIEH again returned to the Red Sea in April, finally returning to Instanbul in September 1913.

During World War One she took part in various sorties against the Russians in the Black Sea but achieved little. After the war she was rearmed with 2 x 5.9 in 45 cal Krupp and 8 x 3 in 50 cal, serving as a training ship 1940-47. Decommissioned in 1947, she became a naval museum at Istanbul 1949-51. After being laid up from 1951 to 1964 was sold for scrapping on 10 September 1964 and towed to Istanbul in 1966 for the scrapping to be completed. She was the last surviving Elswick cruiser.

CHAPTER 4
ARMOURED CRUISERS

Introduction

Before considering the development of the armoured cruisers built by Armstrongs it is necessary, first, to put them in context, and then to look at the development of armour which made this type possible. The armoured cruisers of the late nineteenth and early twentieth centuries were faster than contemporary battleships, with protected main and secondary armament, carrying vertical side armour (supplemented by a protective deck and often a raft body as well) giving protection against high explosive shell fire delivered by quick-firing guns, and armed with a combination of two to eight medium calibre guns and large numbers of quick-firers. The type was first realised in the French DUPUY DE LOME, ordered in 1886 but not completed until 1890: "faster than the strongest, stronger than the fastest" epitomised this first example of a true armoured cruiser.

The need to protect cruising ships without adding too much weight, which would reduce speed, was brought about by quick-firing guns discharging high explosive shells, which would, it was thought, riddle a ship's sides, allowing water in and rendering the ship unstable. But what was the best way to achieve this? The Royal Navy and Armstrongs had no doubts. Weight for weight, the combination of a sloping protective deck, a minutely subdivided raft body above this deck, containing coal bunkers, with bunkers at the sides, offered a far better protection than a thick, narrow waterline armoured belt surmounted by a flat deck in the earlier type of armoured cruiser (more properly belted cruisers) built by a number of navies in the 1870s and 1880s and epitomised by the British ORLANDO class.

The French Navy, impressed by the increased resisting power offered by Schneider's improved steel, departed from this model by using relatively thin (100 mm) vertical steel armour in the DUPUY DE LOME which extended from 1½ metres below the waterline to 5 metres above. This was supplemented by an above water arched protective deck, a minutely subdivided raft body filled with coal, and, as a floor, a thin flat deck to keep shell splinters out of the machinery and magazines. This combination, even though thin armour was used, had been shown by experiments to cause a high explosive shell to burst outside the hull.

The Royal Navy, and British shipbuilders, regarded the DUPUY DE LOME's armour as very vulnerable to large common shell, only turning to the idea of armour of medium thickness, spread over large areas, for battleships as well as cruisers, when improvement in the quality of armour made this a practical proposition; adequate protection could now be obtained, but not at the cost of weight, which would result in greater displacement and less speed. How did this improvement come about?

The first type of armour, introduced in 1855, was made of wrought iron. No improvement in the quality was made until the introduction of all steel armour in 1876 by Schneider, but this was regarded by Britain as being too brittle and prone to crack. A year later, two British firms independently hit on the idea of combining the toughness of iron with the hardness of steel, by welding a hard steel face to an iron back, producing compound armour; in practice, the joint between steel and iron proved to be a weak point.

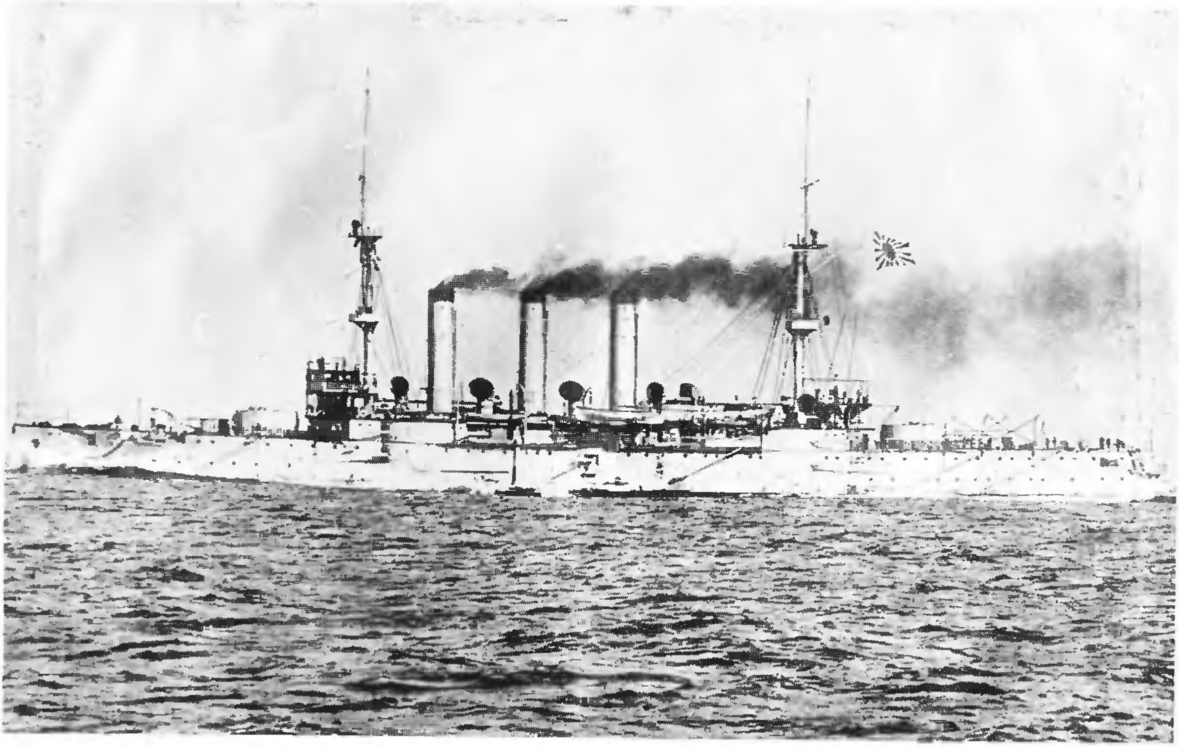
By 1888, both in Britain and France all steel armour had been much improved by the addition of nickel, which gave increased toughness. The next important step was when an American, H A Harvey, introduced nickel steel which had been face hardened by carburation; by 1892 six inches of Harvey-nickel was equivalent in resisting power to ten inches of compound armour. At this point it became a practical proposition, in the view of the DNC, to place vertical armour on cruisers. The need for armour was confirmed by firing tests conducted against old ironclads showing the destructive power of high explosive shell against unarmoured structures. In 1895 Krupp introduced his new armour, which was a nickel chromium alloy of steel, face hardened by an improved carburation process. Six inches of Krupp's cemented armour was equivalent to twelve and a half inches of compound armour, and sixteen inches of wrought iron.

Initially, the function of the armoured cruiser was seen as threefold: commerce destruction, commerce protection, and dealing with cruisers and torpedo craft engaged in scouting for or protecting the battleship line. Later, the larger ones were seen as being able to be added to the battle line, or being used as a fast wing. W H White, the DNC, seems to have originated this idea which was particularly attractive to smaller navies who saw them as a cheap substitute for the battleship. With this change in function the armament, protection and displacement of the armoured cruiser increased, so that the final type proper displaced 15,000 tons and mounted 12 in guns.

Armstrongs built two armoured cruisers for Chile (although the first of these, ESMERALDA, had a narrow waterline belt and was properly a belted cruiser), four for Japan, and three for the Royal Navy to DNC designs.

Table 4/1 shows the Armstrong built IDZUMO compared with five of her near contemporaries; the Royal Navy's KENT, the Italian GIUSEPPE GARIBALDI, the French JEANNE D'ARC and DUPLEIX and the French built, Russian BAYAN. Each brings out the different characteristics necessitated by different functions. KENT was designed for high seas commerce protection, sacrificing armament and armour for a high continous sea speed and great endurance. At the other extreme GARIBALDI, on 2000 tons less displacement, had a well protected heavy armament, but sacrificed speed, being little faster than some contemporary battleships. She and her near sisters in the Italian Navy were rated as second class battleships; all were built to take their place in the main battle line. IDZUMO was also seen as being able to take part in the battle line, but in addition, able to operate independently, and at higher speed than contemporary battleships. At the same time she was much more seaworthy, carrying more of her 6 in guns at upper deck level. JEANNE D'ARC was designed for ocean going commerce destruction and like KENT sacrificed gun power and armament for speed and high endurance. DUPLEIX, the first of the KLEBER class, demonstrates how the demands of commerce raiding attempted on a moderate displacement resulted in thin armour and a relatively puny armament. BAYAN was the best balanced design and was regarded in her day as the finest armoured cruiser in the world for her size.

By 1914 the type had been outclassed by battle cruisers and fast dreadnoughts and in World War One their only employment which did not meet with disaster was on distant stations where they were not likely to meet dreadnoughts.



IWATE off the Tyne on completion, February 1901 Photo : WSPL

TABLE 4/1
ARMOURED CRUISERS COMPARED

	IDZUMO	KENT	GIUSEPPE GARIBALDI	JEANNE D'ARC	DUPLEIX	BAYAN
Year of Launch	1899	1901	1899	1899	1900	1900
Country	Japan	G Britain	Italy	France	France	Russia
Built By	Armstrongs	Portsmouth	Ansaldo	Toulon	Rochefort DY	La Seyne (France)
Displacement (tons)	9800	9800	7400	11270	7700	7800
Dimensions (ft)	400 x 68	440 x 67	344 x 50	477 x 63	418 x 58	449 x 57
Armament	4 x 8 in 14 x 6 in	14 x 6 in	1 x 10 in 2 x 8 in 4 x 6 in	2 x 7.6 in 14 x 5.5 in	8 x 6 4 in 4 x 3.9 in	2 x 8 in 8 x 6 in
Broadside	4 x 8 in 7 x 6 in	9 x 6 in	1 x 10 in 2 x 8 in 7 x 6 in	2 x 7.6 in 7 x 5.5 in	6 x 6.4 in 2 x 3.9 in	2 x 8 in 4 x 6 in
Armour: belt	7 in - 5 in	4 in	6 in	6 in - 1.6 in	4 in	8 in - 4 in
turrets	6 in	5 in	6 in - 3 in	5 in	4 in	7 in
casemates	6 in	4 in	6 in*	5 in		3 in
deck	2½ in	2 in	1½ in	2 in	2¾ in	2 in
type	Krupp	Krupp	Krupp	Harvey Nickel	Krupp	Krupp
Speed (Knots)						
Maximum	21.5	24.0	20.0	23.0	21.0	21.0
Continuous sea	ca 19.0	ca 21.5	ca 17.0	ca 21.0	ca 20.0	ca 20.5
Coal (tons)						
Normal	550	800	650	1400	880	750
Maximum	1400	1600 + 400 oil	1200	2100	1200	1100

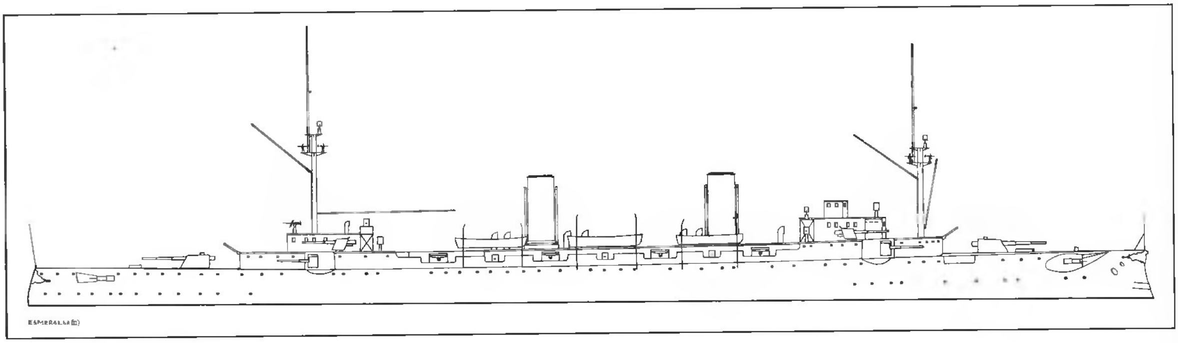
* battery, not individual casemates

Sources : JFS 1902, 1904. Manning.

ESMERALDA
Chile

Yard & No	Laid down	Launched	Final Trials	Designer
Elswick 639	4 Jul 1895	14 Apr 1896	Sep 1896	Phillip Watts

Displacement	7032 tons
Dimensions	436 (468 ft 3 in oa) x 52 ft 5 in x 20 ft 6 in [132.9 (142.7 oa) x 15.9 x 6 24]
Armament	2 x 8 in 40 cal, 16 x 6 in 40 cal QF, 8 x 12 pdr QF, 10 x 6 pdr QF, 4 mg. 3 x 18 in TT aw.
Armour	Harvey. Belt 6 in, 7 ft wide 328 ft long. Bulkheads 6 in. CT 8 in. Gunshields 4½ in. Deck 1½ in, slopes and flats behind belt, 2 in slopes and flats at ends.
Machinery	2 sets VTE by Humphrys Tennant. 6 double-ended cylindrical boilers. Designed IHP ND 16,000 = 22.25 knots, FD 18,000 = 23 knots. Trials IHP ND 16,020 = 23.03 knots, 22.75 knots mean.
Fuel	Coal. 550 tons normal, 1374 tons maximum. Endurance 7680 miles at 10 knots.
Complement	513

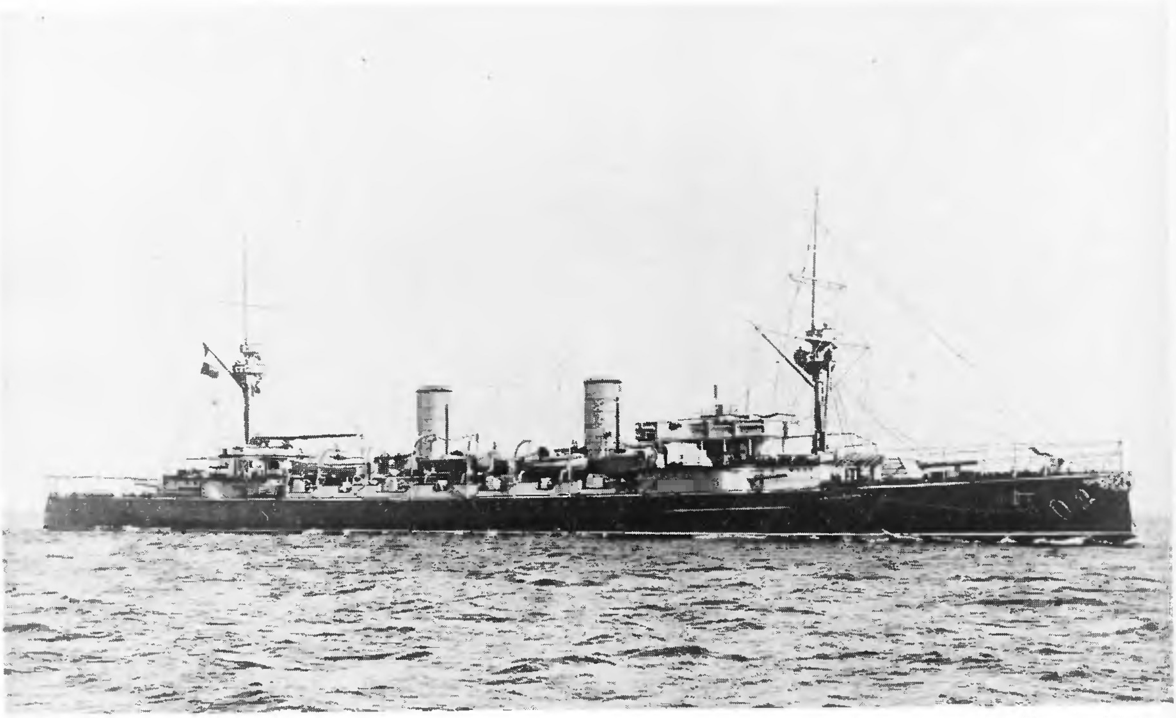


ESMERALDA 1896

General

The design history outlined in the Yard Report book is not entirely clear. In November 1894, a tender was submitted to Chile for a 4800 ton sheathed cruiser with a speed of 23-23.5 knots, with the same armament as BLANCO ENCALADA or if required 2 extra 6 in guns. In May 1895 the tender was accepted but the size of this ship had grown to 6000 tons. Two months later, the Chileans asked Armstrongs to consider the possibility of altering the ship to a belted cruiser. The design submitted was for a vessel with a 6 in armour belt, 7 ft wide and 330 ft long: six extra 6 in guns were to be added and the ship was to be lengthened by 28ft. This modified design was ordered, but Armstrong's strongly advised that the ship be completed as originally contemplated, and that Chile should in addition order a second vessel, an armour-clad of 7000 tons which could be delivered in 15 months; the Chileans asked for the vessel already ordered to be continued as a belted cruiser to be completed in 13 months.

Sir William White, DNC, strongly criticised ESMERALDA by observing that "on paper she will appear a formidable rival to the new cruisers with her reputed speed of 23 knots, partial belt of 6 in armour, and armament including two 8 in, sixteen 6 in and other guns. But this speed is not one realised except for short periods and her sustained sea speed would undoubtedly be much less than that of our cruisers, probably 2 - 3 knots less. Her partial armour belt is of fictitious protection and there is only shield protection to the guns".



ESMERALDA on delivery, September 1896

Photo : Vickers

The 8 in guns had automatic breech opening gear: there was a central hoist for powder only and in the rear of the guns there was a handworked tube for supplying shells or powder. One original feature was the installation of blast shields at the ends of the superstructure deck, to protect the crews of the 8 in guns from the effect of the four 6 in guns mounted above them. This seems to be the first appearance of blast shields, which were a prominent feature in cruisers and destroyers built during and after World War One. These four 6 in guns were removed in the 1910 refit, and at the same time fire controls were fitted, the lower platform on the foremast becoming a roofed top and another mounted low on the main mast.

Career

After her gun trials were complete, ESMERALDA departed from Plymouth in March 1897. Her life was uneventful and she was discarded in 1929.

O'HIGGINS

Chile

Design History

The O'HIGGINS Particulars Book, now in the National Maritime Museum, contains an unusual amount of detail about how the ship design developed. This is worth reproducing as it illustrates the play of demand and response between the owners and the naval architect. The written details are not accompanied by drawings, so that the sketches here are to some degree conjectural.

In September 1895 Armstrongs were asked to tender for a fast cruiser of 7,300 tons with a 7 in Harvey belt and an armament of 2 x 8 in and 10 x 6 in guns. Three alternative designs were initially prepared. All had the following features in common, but with differing armaments.

Displacement	7500 tons.
Dimensions	400 x 62 x 22 ft
IHP & Speed	ND 13,000 = 20¾ knots, FD 16,000 = 21¾ knots.
Fuel	Coal. 550 tons normal. 1200 tons maximum.
Armour Harvey	Belt - 7 in thick in way of machinery, 5 in at ends, 7 feet wide, 260 feet long. Bulkheads - 5 in. Casemates - 7 in fronts, 5 in backs. 8 in gun bases - 7 in. CT 9 in.
Nickel steel	Director tower - 3 in Ammunition tubes - 5 in for 8 in & 6 in guns, 3 in for 4.7 in.
Mild steel	Deck 1¼ in, in way of belt, 2 in at ends.

Design I

Armament

2 x 8 in in gunhouses
8 x 6 in in casemates, 2 x 6 in in upper deck shields
4 x 4.7 in in upper deck shields
10 x 12 pdr, including 2 field guns, 10 x 6 pdr, 4 mgs
3 TT, 1 above water, aft. 2 submerged forward.

Design 2

Armament

4 x 8 in in upper deck gunhouses
4 x 6 in in casemates aft, 6 x 6 in in upper deck shields
12 pdr and lesser as Design I.

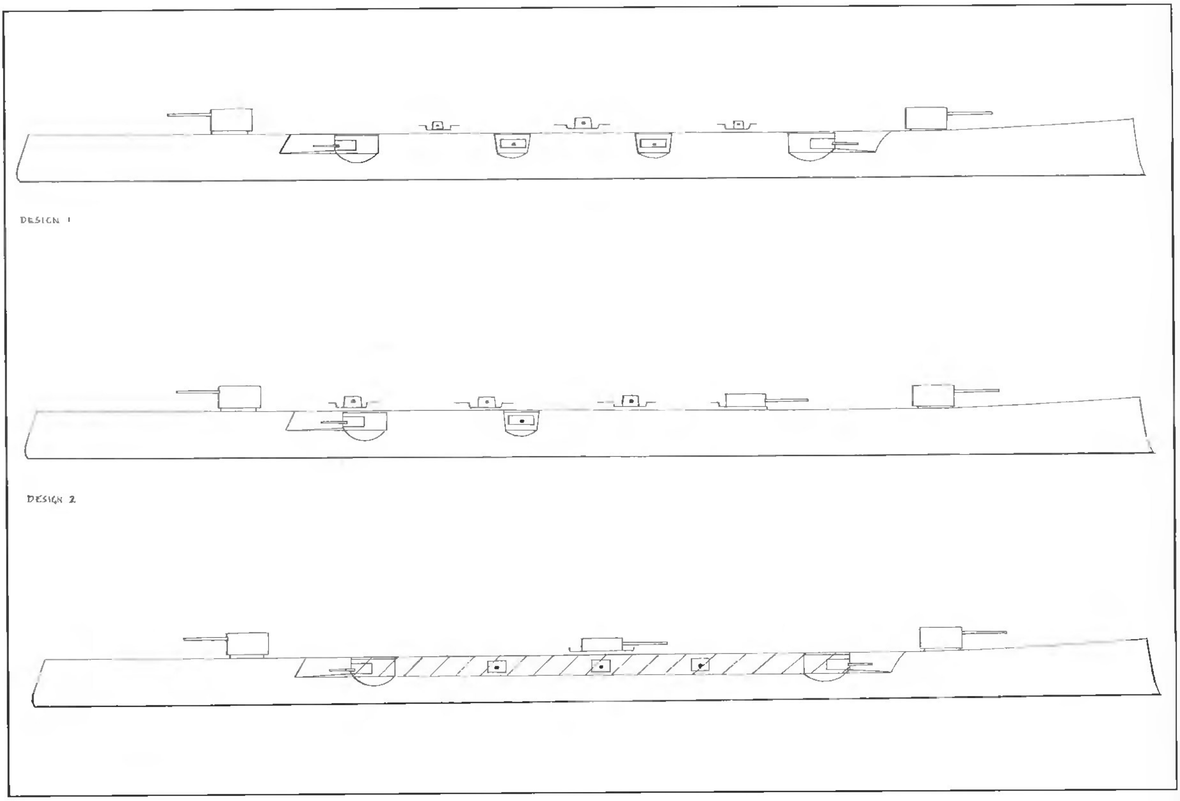
The 4 - 6 in, in the forward casemates in Design I, were to be mounted on the upper deck in place of the 4.7 in and their places taken by 2 x 8 in, in upper deck gunhouses.

Design 3

Armament

as Design 2 but differently distributed.
2 x 8 in 1 forward and 1 aft) on upper deck
2 x 8 in, 1 on each broadside amidships to fire fore and aft)
10 x 6 in in a 5 in citadel on main deck
Smaller guns mainly to be mounted on the boat deck.

O'HIGGINS, Preliminary Design Sketches



The next set of designs were prepared after Phillip Watts had returned from Paris, having presented the first three to the Chilean Naval Commission. The modifications suggested to Design 1 were the addition of 2 broadside 8 in guns, either in a 7 in citadel or casemates on the main deck forward or to be mounted in gunhouses in place of the forward 6 in upper deck casemate guns. With these modifications it was stipulated that the displacement should not exceed 8000 tons or the draft 22 feet. The designs were altered, but it was found impossible to keep the displacement to 8000 tons and a fresh series of modified designs were drawn up with the main characteristics thus:-

Displacement	8300 tons
Dimensions	400 pp x 64 x 22
IHP & Speed	ND 15,000 = 21¼ knots
Coal	550 tons normal, 1200 tons maximum.

Three alternative armament designs, D, B & C were prepared.

Arrangement D	2 x 8 in	in upper deck gunhouses fore and aft
	2 x 8 in	in main deck citadel (7 in fronts & 5 in backs)
	4 x 6 in	in upper deck casemates (7 in & 5 in)
	2 x 6 in	in main deck casemates aft
	4 x 6 in	shield mounted on upper deck
	4 x 4.7in	shield mounted on upper deck
	Smaller as before	

Armour was to be similar to Design 1 except that the protective deck was increased to 1½ inches in way of the belt.

Arrangement B

As D but with the citadel 8 in guns to be mounted in barbettes on the upper deck forward.

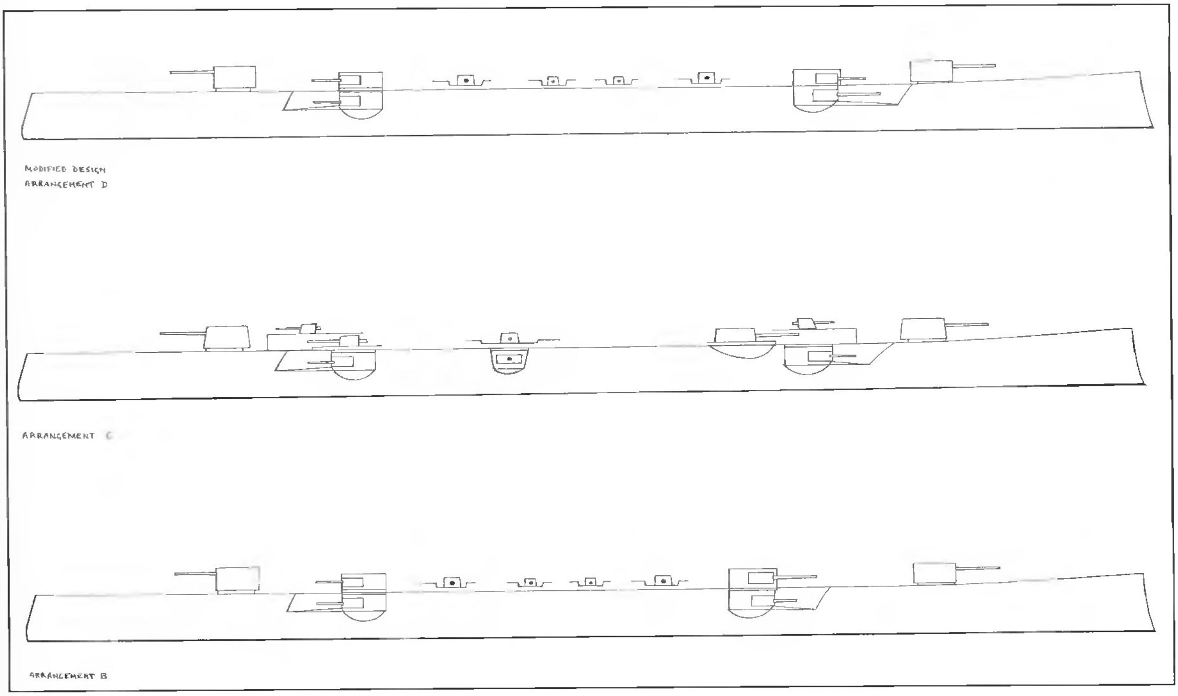
Arrangement C

6 in barbette shields as in the Norwegian coast defence ships instead of gunhouses (these were larger and heavier than the gunhouses finally fitted). The armament would then be disposed thus:-

2 x 8 in	in barbettes with 6 in shields, fore and aft
2 x 8 in	in barbettes with 6 in shields in sponsons foreward on the upper deck
6 x 6 in	in main deck casemates - 2 forward and 4 aft
4 x 6 in	in shields on upper deck
4 x 4.7 in	on shelter deck forward at upper deck level.
Smaller as before	

Each of the Norwegian type shield and barbette mountings complete with gun weighed 70.6 tons compared with the 36.3 tons for the original gunhouses and gun. The finally approved armament was as arrangement C but with the original type of gunhouse, and with the upper deck 6 in also in gunhouses. The 8 in gunhouses had 7 in fronts and 5 in rears; they were fitted with a powder hoist coming up to the left of the gun protected by a 5 in tube. 21 shells could be stowed in the rear of the gunhouse for ready use, the supply being replenished through the powder hoist.

O'HIGGINS, Modified Preliminary Design Sketches

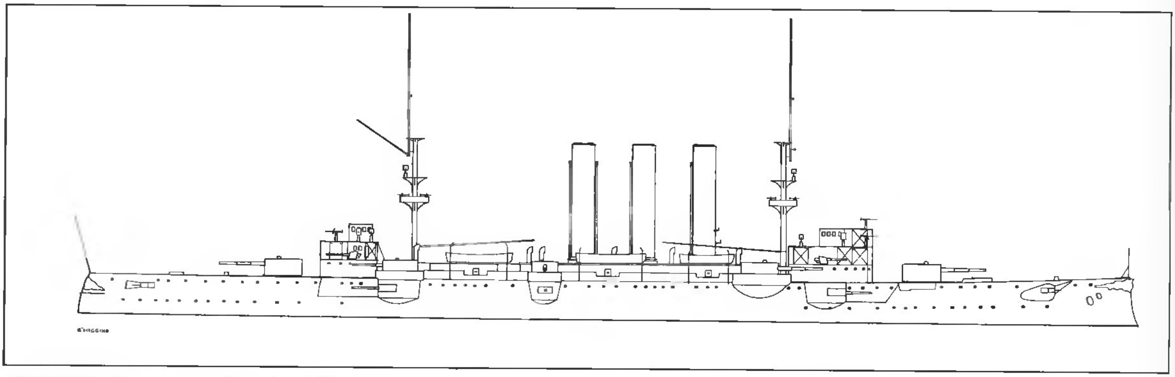


Machinery and Boilers
Hawthorn and Humphrys put forward proposals for three different types of boilers. Belleville, Thornycroft and Niclausse. Initially the proposal was for ND 13,000 IHP and FD 16,000 IHP but finally 16,000 IHP at ND was proposed. The Thornycroft boilers were lighter than the Belleville but the latter took up 8 ft less space. The Chileans insisted on the Belleville type of boiler but because of their greater weight the ship was lengthened 8 ft and 3 in more draught allowed.

O'HIGGINS

Yard & No	Laid down	Launched	Final Trials	Designer
Elswick 650	19 Mar 1896	17 May 1897	May 1898	Phillip Watts

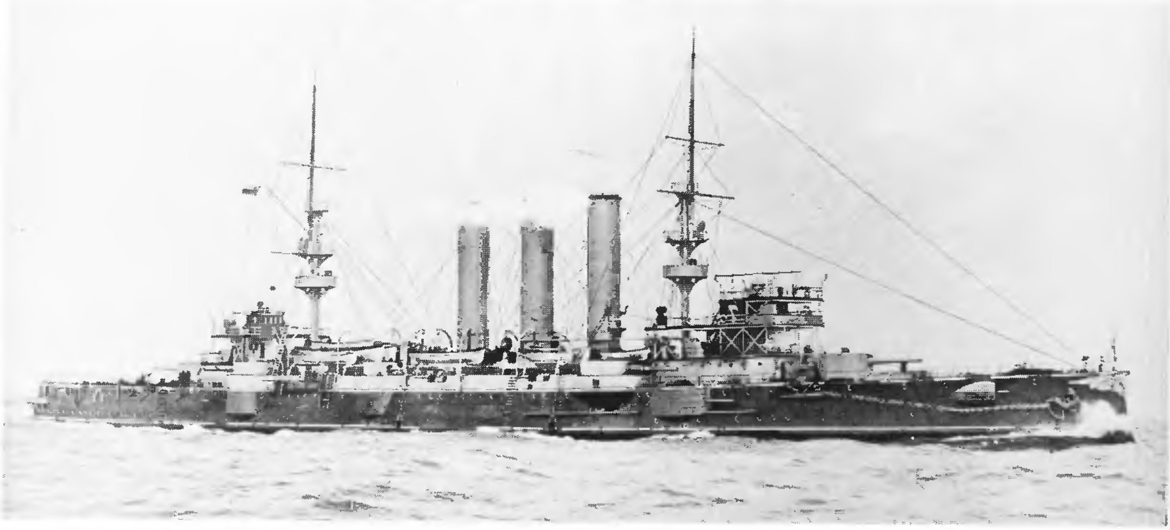
Displacement	8476 tons. 8234 tons on trial.
Dimensions	412 (446 oa) x 62 x 22 [125.6 (135.94) x 18.9 x 6 7]. Freeboard forward 21 ft, amidships 15 ft, aft 16 ft 9 in
Armament	4 x 8 in 45 cal, 10 x 6 in 40 cal QF, 4 x 4.7 in 45 cal QF, 10 x 12 pdr QF, 10 - 6 pdr QF, 4 mg. 3 x 18 TT. 2 submerged broadside, 1 aw at stern.
Armour	Harvey-Nickel. Belt 7in - 5 in, 7 ft wide, 260 ft long. Bulkheads 5 in. Deck 1½ in slopes and flats behind belt, 3 in slopes, 2 in flats at ends. CT 9 in. 8 in gunhouses : 7 in front, 5 in back. 6 in gunhouses (x4) and 6 in casemates (x6) : 6 in front, 5 in back.
Machinery	2 sets VTE by Humphrys Tennant. 30 Belleville boilers in 3 groups. Designed IHP 16,000. Trials IHP 15,930 = 21.48 knots.
Fuel	Coal. 550 tons normal, 1253 tons maximum.
Complement	489



O'HIGGINS as completed, 1898

Career

Just before her trials the specially hired crew of stokers went on strike, and the Chilean stokers, untrained in the use of watertube boilers, were substituted with excellent results. A year later in Chile she exceeded her original trial speed.



O'HIGGINS on acceptance trials, May 1898

Photo : Vickers

In 1931 O'HIGGINS took part in the naval mutiny (details of which are in the section on ALMIRANTE LATORRE). She underwent major refits in 1919 to 1920 and 1928 to 1929. In the first of these fire controls were fitted in the lower tops on both masts, which were roofed. Searchlights were removed from both upper platforms and tall w/t topmasts fitted to both masts. In the second refit the lower searchlight platforms were removed, the roof removed from the after top and two searchlights mounted on it, the fore bridge enlarged and the wings of the after bridge removed. She was discarded in 1946.

ASAMA TOKIWA

Japan

General

The Director's minute book records that a telegram was received in June 1896 from Andrew Noble, then in Japan, instructing the laying down of two stock cruisers. In July the Yard was instructed by the Board to lay down these two which were to displace 9650 tons, to be armed with four 8 in and fourteen 6 in guns and be capable of 21.5 knots. There were delays of three and six months in laying down and in June 1897 the pair were sold to Japan. Previous stock ships had been laid down singly, were all much smaller craft of the protected cruiser type, and always at the yard's initiative, so that this pair represented a total departure from normal practice. The most likely explanation is that Armstrongs were anticipating a firm Japanese order.

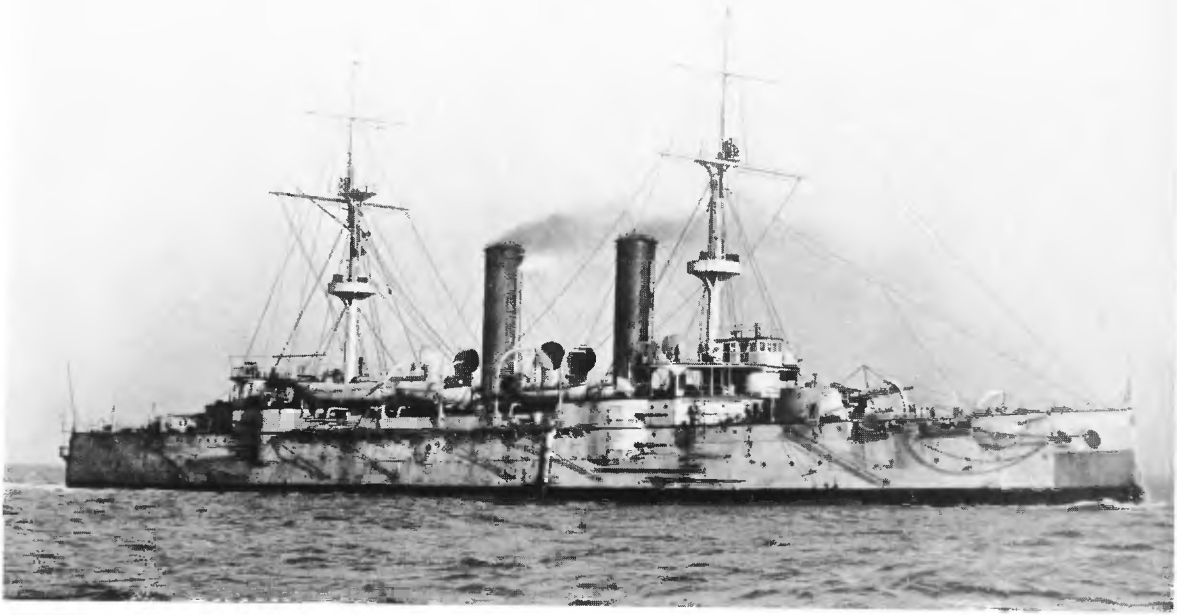
Design History

The first proposal, put forward on 20 June 1896, was for an improved O'HIGGINS.

Displacement	8,500 tons
Dimensions	400 x 64 x 22 feet
Machinery	2 sets 4 cylinder VTE cylindrical boilers. ND IHP 8500 = 18 knots. FD = 12,500 = 20 knots.
Fuel	Coal. Normal 800 tons, Maximum 1500 tons.
Armament	4 x 8 in guns, twin mounted in barbettes, forward and aft. 10 x 6 in QF guns in casemates, six on the main deck and four on the upper. 12 x 12 pdrs, four on main deck, four on upper deck and four on bridges. 7 x 3 pdrs, two on bulwarks, four on casemates tops and one for field gun use. Four maxims in the fighting tops. Five torpedo tubes; two submerged forward, two submerged aft and one above water in the stern.
Armour	A waterline belt 375 ft long, 7 in thick and 7 ft wide, extending from 5 ft below the waterline to 2 ft above, and carried 6 ft abaft the after perpendicular so as to protect the steering gear; the end bulkheads were to be 7 in thick. On top of this was an upper belt, or citadel, extending from the top of the 7 in armour to the main deck, 7 ft wide and 208 ft long at the side, 250 ft long at the centre line, with bulkheads running diagonally inboard to form bases for the barbettes. CT, 14 in with 18 in tube. Casemates, 6 in fronts and 2 in backs. Gunhouses, 6 in with 6 in barbettes. Protective deck 2½ in from end to end. The belt and CT were to be of Harveyed steel, the CT tube, casemate front, gunhouses and barbettes were to be nickel steel, and the remainder mild steel.

A second variant was proposed in the following month, which was identical apart from armour and protection. The waterline belt was to run from 6 ft abaft the aft perpendicular right forward to the stem. It was to be 7 in thickness for 146 ft each side entirely protecting the machinery space, and forming the base of the 5 in citadel immediately above. From the ends of the 7 in belt, a distance of 68 ft forward and 58 ft aft, so as to entirely protect the magazines, was a 6 in belt; at the ends of this was a 3 in belt running forward 76 ft to the stem, and 58 ft aft to 6 ft forward of the aft perpendicular terminated by a 3½ in bulkhead aft. The total length of this belt was 404 ft. However, the 5 in citadel was shorter, giving 140 ft at the side of the ship protecting the casemate bases, and 152 ft at the centre line. The citadel was terminated by 5 in thwartship bulkheads which ran from the protective to the main decks. Width of belt and citadel was each 7 ft, but the width of the citadel forward was slightly wider because of the deck sheer. The above water torpedo tube was moved forward and was protected by a patch of 6 in Harveyed steel 23 ft by 9 ft on each side. As with the first design the protective deck was 2½ in from end to end.

Shortly afterwards a third design was produced, with the same dimensions, speed, coal capacity and machinery as in the first design. The armament was the same except the aft tube was moved forward but with important modifications to the armour. The belt again ran from the stem to 6 ft aft of the after perpendicular, with the same 7 ft width. The 7 in portion of the belt now extended for a length of 204 ft, entirely protecting the machinery spaces,



ASAMA on trials, Winter 1898-99. Note that her standard compass on the charthouse roof stands directly on the deck. TOKIWA's stands on a small platform, if visible one of the few differences between the two sisters.
Photo : NAI

submerged torpedo rooms and parts of the magazines, and again formed the base of the 5 in citadel above. The 5 in portion of the belt ran for 38 ft forward and 30 ft aft so as entirely to protect the magazines. From the ends of the 5 in portion the belt was now of 3½in thickness. The total length of the belt was 406 ft. The 5 in citadel was lengthened to 208 ft on the side, running in diagonally to form the barbette bases so that the total length of the citadel on the centre line was 250 ft. The bow tube protection, deck and gun protection were as before.

Further modifications were made in July 1896 with the displacement increased to 9520 tons with dimensions of 400 ft x 67 ft x 23 ft 9 in. IHP was increased to 13,000 ND and 16,000 FD with speeds of 20 and 21 knots but the maximum bunkerage was reduced to 1200 tons. The armament was the same, except that four of the 6 in guns were now mounted on the main deck, and six in upper deck casemates. The armour protection was almost identical except that the protective deck was of 2 in thickness only to allow for a 1 in thick main deck in way of the citadel.

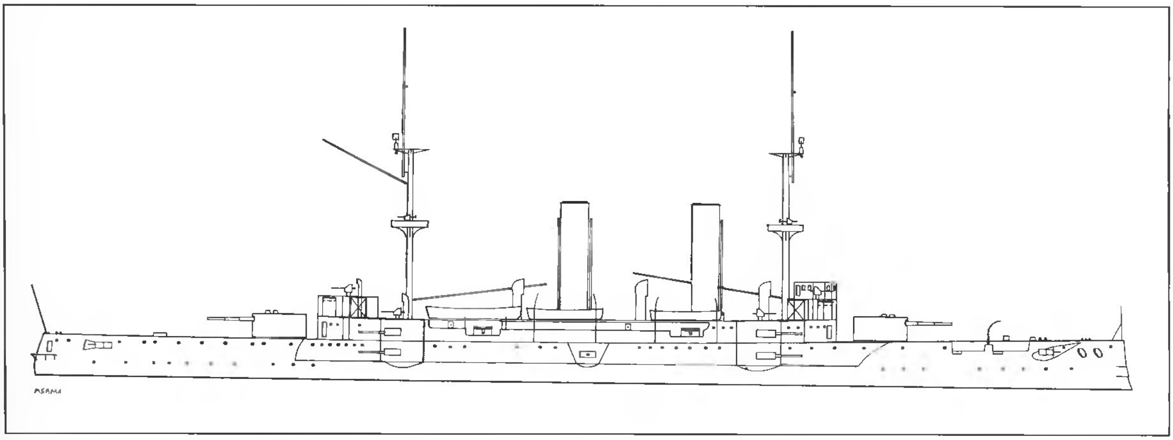
A large number of modifications required were submitted by the Japanese in late June. These included the fitting of two more watertight transverse bulkheads between belt and upper deck, so that each funnel could be housed in a separate compartment. An additional watertight transverse bulkhead was to be provided between main and upper deck, before the forward barbette. Harvey Nickel steel was specified for belt, barbette, casemates and CT; the mast was to be raised and size of the CT increased.

Crew accommodation inside the citadel was considered inadvisable. The vertical keel was characterised as too shallow and too thin, while the framing in the wake of the engines wa insufficient for the water tightness of the double bottom. Two steering engines were considered advisable.

On August 21st the final design was approved with the characteristics as built. Six casemates were to be carried at main deck level but 4 x 6 in guns with shield protection were to be mounted between the four upper deck casemates.

Yard & No	Laid down	Launched	Final trials	Designer
ASAMA Elswick 661	20 Oct 1896	22 Mar 1898	8 Feb 1899	Phillip Watts
TOKIWA Elswick 662	6 Jan 1897	6 Jul 1890	18 Apr 1899	Phillip Watts

Displacement	9670 tons. 9778 tons on trial.
Dimensions	408 (442 oa) x 67 x 24 ft 5 in [124.36 (134.72 oa) x 20.5 x 7.42]
Armament	4 x 8 in 45 cal, 14 x 6 in 40 cal QF, 12 x 12 pdr QF, 8 x 2½ pdr QF. 5 x 18 in TT, 4 submerged broadside,1 above water at bow.
Armour	Harvey-Nickel. Belt 7 in-5 in-3½ in. Lower deck side 5 in. Bulkheads 5 in. Deck 2 in flats and
slopes.	Barbettes and gunhouses 6 in. Casemates (x 10) 6 in front 2 in rear. Shield to bow TT 6 in. CT 14 in. Observer tower aft 3 in.
Machinery	2 sets VTE by Humphrys Tennant. 12 single-ended cylindrical boilers. Designed IHP. ND 13,000 = 20 knots. FD 18,000 = 22 knots. ASAMA trials IHP ND ca13,000 = 20.37 knots. FD 19,000 = 22.07 knots. TOKIWA trials IHP ND 14,000 = 20.85 knots. FD 19,040 = 23.1 knots
Fuel	600 tons normal. 1410 tons maximum.
Complement	661



ASAMA and TOKIWA 1899

Armament

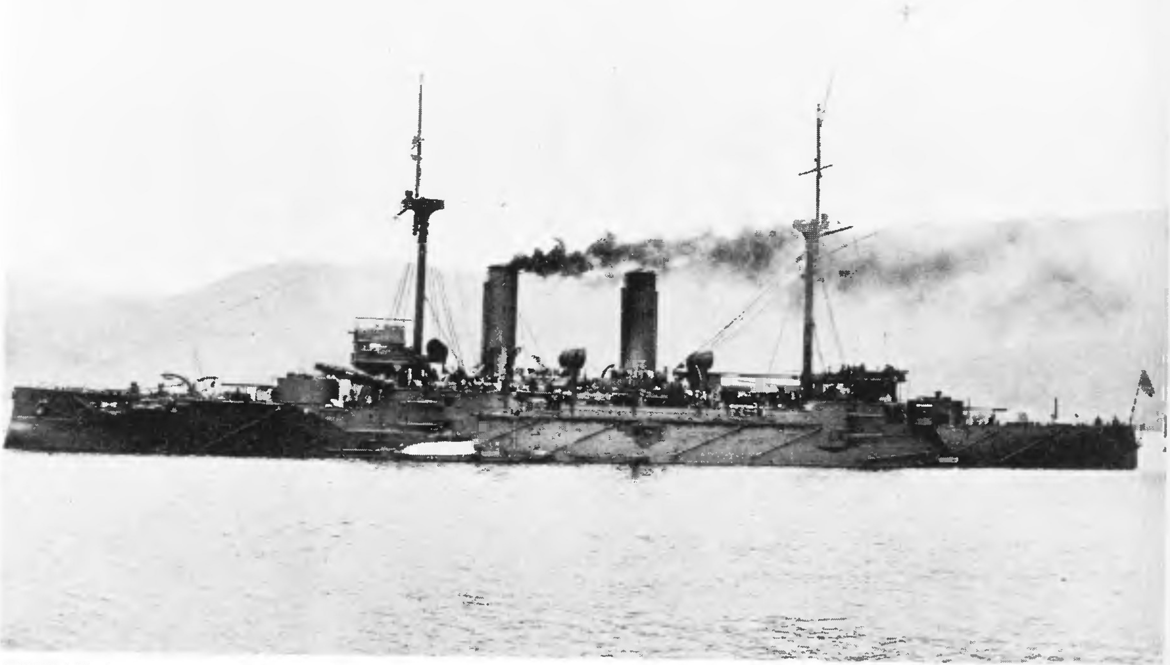
Training of the 8 in turrets was by hydraulic, electric, or hand power. 30 rounds per gun were carried in each gunhouse, with an electric bollard to enable ammunition to be replenished. Cordite supply was by a central hoist, opening between the guns. The 8 in guns had 120 rounds per gun with 150 for each of the 6 in, and with stowage for another 50 for each gun.

Careers

ASAMA

She was present at the Coronation Review for King Edward VII in June 1902, wearing the black and white livery which was discarded in 1903.

In the Russo-Japanese War she was assigned to the Second Division of Admiral Kamimura's Second Squadron. She played a major part in damaging the Russian cruiser VARYAG at Chemulpho on 9 February 1904, while temporarily attached to Admiral Uriu's 4th Division; she sustained no casualties at the action. She was attached to the Third Division in August 1904 and thus took part in the Battle of the Yellow Sea on 10 August 1904, only coming into action towards the end of the battle as she had been away coaling; she sustained no casualties. Like the rest of the Japanese fleet she was refitted at the end of 1904 after the Russian Port Arthur Fleet had been put out of action, and her fighting tops were removed.



TOKIWA in 1905, with fighting tops removed, canvas dodgers round the searchlight platforms at her lower mastheads, and in the darker grey livery adopted during the war. Photo : Author's collection

At the Battle of Tsushima 27-28 May 1905 she was once more part of Kamimura's Armoured Cruiser Squadron. In the opening stages she was temporarily detached to provide cover for a flotilla of destroyers and torpedo boats, but as there was too much sea for the small craft to operate efficiently, ASAMA rejoined the rear of the Squadron Second Division and was last but one in Admiral Togo's battle line. At 1428 she was struck aft near the water line by three shells, which disabled her steering gear, and had for a time to leave the line for temporary repairs; she rejoined at 1705 five feet deeper in the water than normal and considerably slowed up. During the course of the battle she sustained 11 hits and had three crew killed, and 13 wounded. She had to return to Japan for repairs, the only ship which had to do so. At the victory review in Tokyo Bay on 15 September 1905 she had the honour of carrying the Emperor through the lines of the fleet.

At the outbreak of World War One she formed part of Vice Admiral Yamaya's First South Sea Squadron, searching for Von Spee's squadron in the Marshalls and Carolines Islands; she later patrolled off Honolulu to keep the German raider GEIER under observation until the Americans interned her. She was wrecked in San Bartolomé Bay on the coast of Mexico on 31 January 1915. She was refloated in May and was under repair until March 1917. During this period, her cylindrical boilers were replaced by 16 Miyabara watertube boilers.

ASAMA was reclassified as a first class coast defence ship 1 September 1921. In 1935 she struck an uncharted rock and was never repaired. She was reclassified as a training ship in 1942; thereafter was hulked and carried light AA guns only. In August 1946 she was sold for scrapping.

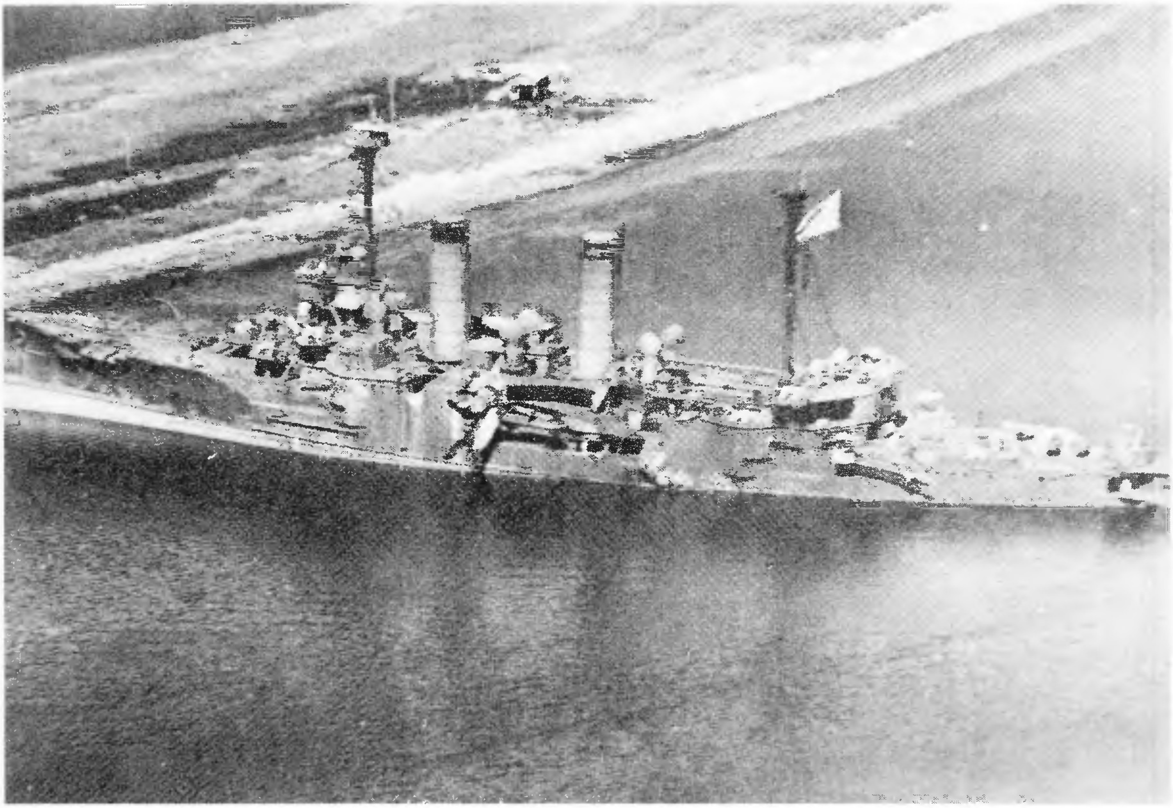
TOKIWA

Like her sister, TOKIWA was one of Kamimura's Second Division of the Second Squadron in the Russo-Japanese war and took part in the initial operations against Port Arthur and Vladivostock. At the Battle of Ulsan, 14 August 1904, she was in action against Admiral Iessen's three armoured cruisers RURIK, ROSSIYA and GROMOBOI. She was hit three times but suffered no casualties.

In a refit at the end of 1904 her tops were removed. At Tsushima, as part of Admiral Kamimura's Squadron, she was in the rear of the main battle line sustaining nine hits with one killed and 14 wounded.

She was reboilered in 1910 with 16 Miyabara water tube boilers. In World War One she took part in the capture of the German colony of Tsingtao and then searched for SMS DRESDEN in the Indian Ocean. Later she was attached to Vice Admiral Yamaya's First South Sea Squadron.

TOKIWA was reclassified as a first class coast defence vessel in 1921 and in the following year was converted to a minelayer, when her after 8 in turret was removed and minelaying apparatus fitted, carrying 200 to 300 mines. Three mines accidentally exploded in August 1927 causing considerable damage. She was in reserve from 1930-40. She was modernised in 1937-38 with 8 Kampon boilers being installed and her speed reduced to 16 knots; most of the rest of her armament was removed and she was fitted to carry 500 mines. In 1940 she recommissioned as a training minelayer. Towards the end of the war she was actively engaged in minelaying but was herself mined in 1945; on 9th August 1945 off Ominato she was bombed and her engine room was hit, and subsequently she was stranded. Her remaining 8 in turret had been removed in 1943 so that at the war's end she had four 6 in mounted in casemates, one 3 in AA and a large number of lighter AA guns.



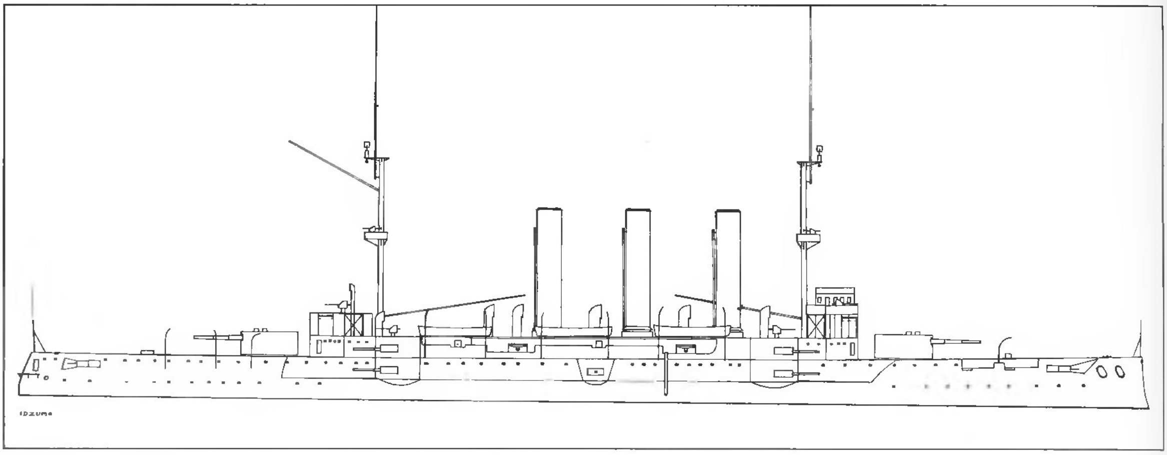
Tokiwa beached near Ominato after bombing by US aircraft, 1945 Photo : USN

IDZUMO IWATE

Japan

Yard & No	Laid down	Launched	Final Trials	Designer
IDZUMO Elswick 681	14 May 1898	19 Sep 1899	6 Sep 1900	Phillip Watts
IWATE Elswick 689	11 Nov 1898	29 Mar 1900	22 Feb 1901	Phillip Watts

Displacement	9600 tons designed. IDZUMO 9,520 tons, IWATE 9,773 tons on trials.
Dimensions	400 (434 oa) x 68 ft 6 in x 23 ft 9 in [121.9 (132.2.) x 20.9 x 7.24]
Armament	4 x 8 in 45 cal, 14 x 6 in 40 cal QF, 12 x 12 pdr QF, 8 x 2½ pdr QF. 4 x 18 in TT submerged broadside.
Armour	Krupp. Belt 7 in - 3 in. Lower deck side 5 in. Deck 2½ in slopes and flats. Barbettes and gunhouses 6 in. Casemates 6 in front, 2 in rear. CT 14 in. Observer tower aft 3 in.
Machinery	2 sets VTE by Humphrys Tennant. 24 Belleville boilers. Designed IHP ND 14,500 = 20.75 knots. Trials IHP ND 16,078 = 21.74 knots (IDZUMO) 15,739 = 22.3 knots (IWATE).
Fuel	Coal. 600 tons normal, 1551 tons maximum.
Complement	682

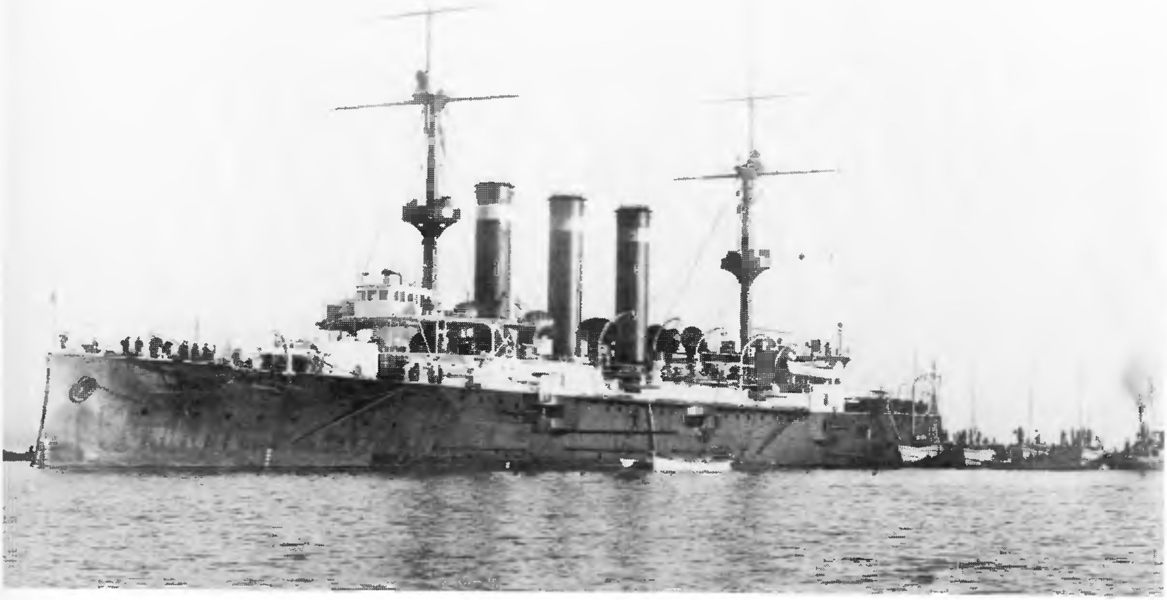


IDZUMO and IWATE, 1900

General

The Elswick Yard Report Book for the 16 September 1897 recorded that a tender for a first class cruiser had been accepted, while an order was received in July 1898 for a second. This pair were almost identical to the preceding two, except that they were a little shorter, 18 in beamier, had the bow torpedo tube suppressed and had water tube boilers of the Belleville type; with normal draught they were a knot faster than ASAMA and TOKIWA. Their most conspicuous difference was their three funnels in place of the ASAMA's two, required to draw up the fumes from their Belleville boilers.

During the design stage there was much discussion, centring on the precise layout of the armour. The Belleville boilers and other improvements made the whole machinery installation some 300 tons lighter than the ASAMA's, and this could be used to improve protection. The most extreme alternative was the first, with a hull form 20 feet longer, but with the belt not lengthened and closed by a bulkhead forward as well as aft. The finally worked-out design suppressed the 5 in portions of the ASAMA's belt, making it 7 in thick over the whole magazine and machinery spaces for 276 feet, with 3½ in ends as before. The citadel was 260 feet long on the centre line, enclosing the 8 in gun turret bases, and the deck was 2½ in thick throughout. The 7 in and 5 in armour was to be Krupp steel, with the 3½ in ends nickel steel and the deck mild steel.



IDZUMO in the handsome but short-lived black and white livery, 1902. Note that the funnel bands cannot be used for identification, as they indicate the position of the ship in her squadron, and changed frequently.

Photo : USN

Armament was as for the first pair except for the absence of the bow tube. Bunker capacity was to be 600 tons normal, 1200 tons maximum, though the full capacity of both ordinary and reserve bunkers was 1551 tons.

Both ships were delivered in the light grey livery worn by the Japanese fleet at the turn of the century. They were briefly painted in the black and white scheme in 1902 before adopting the mid grey war colour in October 1903.

They both lost their fighting tops in their refits in the winter 1904-5, between the fall of Port Arthur and Tsushima. These were replaced with fire control tops about 1912. Other modifications are noted in the career sections of the individual ships.

Careers

IDZUMO

She formed part of Admiral Kamimura's Second Division in the Russo-Japanese War, taking part in operations both off Port Arthur and against the Vladivostok cruisers. She was Kamimura's flagship at the Battle of Ulsan, 14 August 1904, where despite receiving 20 hits she had only three men killed and 16 wounded.

At Tsushima, where she again wore Kamimura's flag, she was in the centre of the battle line and was in action for much of the battle. She sustained 9 hits, with 4 men killed and 26 wounded.

In the summer of 1914 IDZUMO was on the Pacific coast of Mexico, protecting Japanese interests in the troubles which racked that country. When war broke out she joined other allied warships in the search for SMS LEIPZIG, later blocking any move northward by von Spee's squadron.

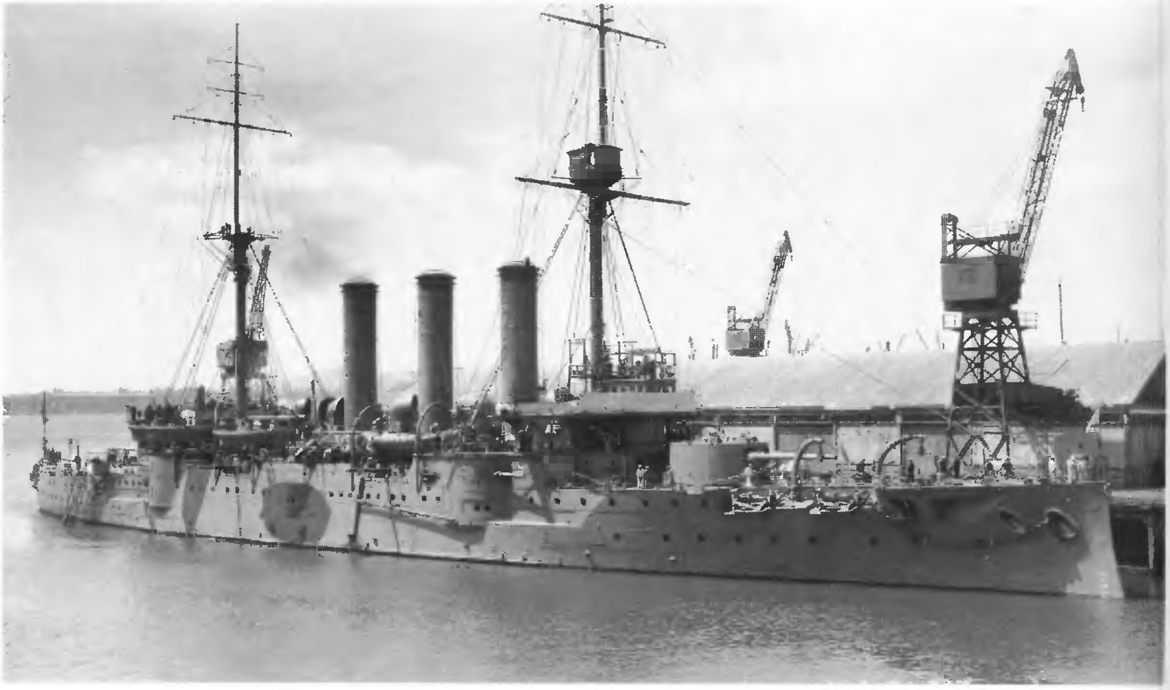
On 1 September 1921 she was re-rated a first class coast defence ship, and was employed on training cruises for cadets and midshipmen. From 1932 to 1942 she was flagship of the China Fleet stationed at Shanghai. On the outbreak of war on 8 December 1941 she sank the river gunboat HMS PETEREL by gunfire. She was reclassified as first class cruiser 1 July 1942. During a refit in 1935 she was reboilered with 6 Kampon boilers, her power being reduced to 7000 IHP and her speed to 16 knots. Her secondary armament was reduced to eight 6 in. She was reclassified to a training ship in 1943, and in the following year her 8 in turrets were replaced by twin 5 in AA guns, her 6 in reduced to four only. Her light AA armament was augmented to 1 x 3 in, 2 triple 25 mm, 2 twin 25 mm, 4 single 25 mm and two single 13 mm. On 24 July 1945 she capsized in shallow water after being bombed near Kure. She was scrapped in 1947

IWATE

In the Russo-Japanese War she was part of Kamimura's Second Division. At the Battle of Ulsan one of her 6 in casemates was hit by an 8 in shell, causing a serious fire and many casualties - altogether she suffered 40 killed and 37 wounded.

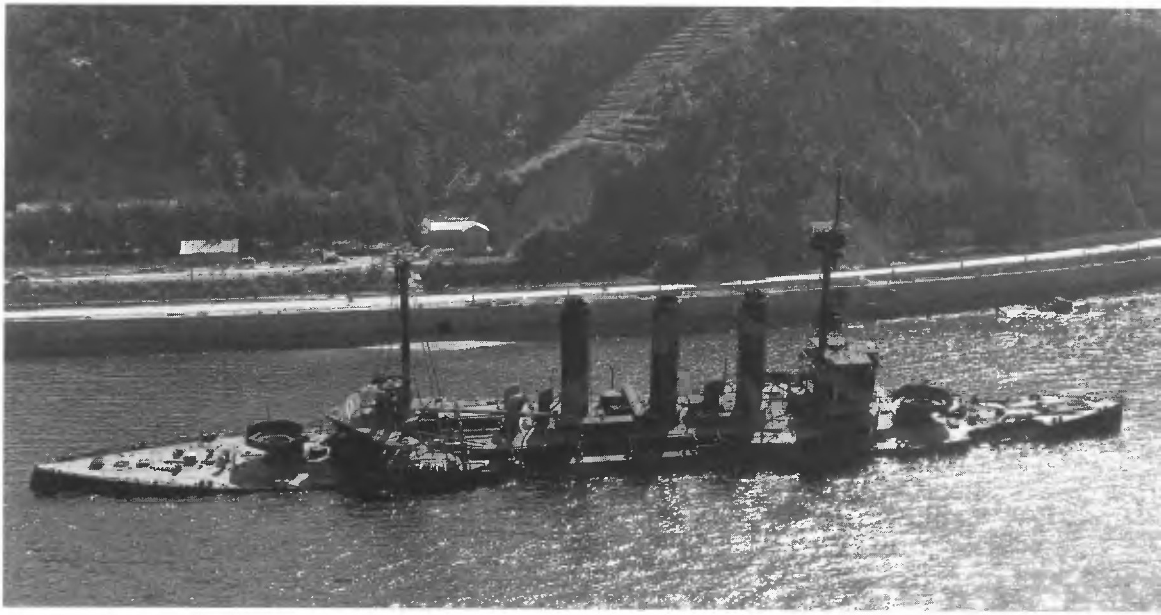
At Tsushima she wore the flag of Rear Admiral Shimamura, and was last in the main battle line. She was badly holed on the waterline, receiving 16 hits in all. Despite this she was the only ship in the line to have no killed, and only 14 wounded. On the morning of 29 May, the day after the battle, she, with the YAKUMO, came upon the coast defence ship ADMIRAL USHAKOV and sank her.

In World War One IWATE took part in the siege and capture of Tsingtao, and when that port fell in November 1914 joined Admiral Yamaya's First South Sea Squadron.



IWATE in the training role, 1932. Note that her main deck 6 in guns have been removed and the casemates plated over.
Photo : NMM N5102

With the other armoured cruisers she was re-rated a first class coast defence ship on 1 September 1921. From 1923 she was employed as a training ship for cadets and midshipmen. In 1931 she was reboilered with 6 Yarrow boilers, reducing her horspower and speed as in IDZUMO. Reclassified as a first class cruiser 1 July 1942, then reduced to training ship status in 1943, and in the following year her 8 in and all but four of her 6 in guns removed, and she was rearmed with two twin 5 in AA, a single 3 in AA and a number of light guns like her sister. After an allied bombing attack on Kure on 24 July 1945 she sank in very shallow water, bottoming with a slight list to starboard. Damage was comparatively slight, and she was refloated after the war and scrapped in 1946.



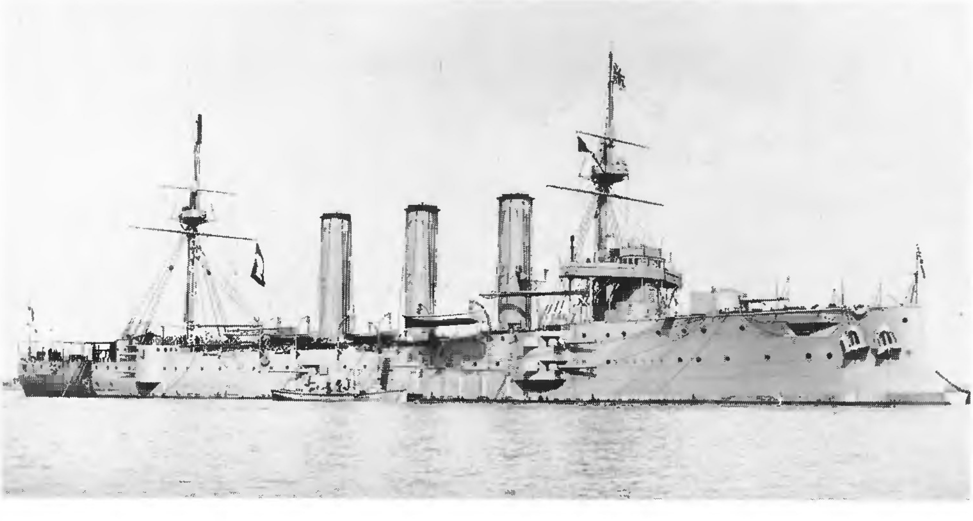
IWATE beached at Kure after air attack. Photo taken in October 1945

Photo : USN

LANCASTER
Great Britain

Yard & No	Laid down	Launched	Final trials	Designer
Elswick 614	4 Mar 1901	22 Mar 1902	3 Mar 1904	DNC

Displacement	9901 tons
Dimensions	440 (463 ft 6 in oa) x 66 ft 4 in x 24 ft 6in [134.1 (141.3) x 20.24 x 7.5]
Armament	14 x 6 in QF, 10 x 12 pdr QF, 3 x 3 pdr QF. 2 x 18 in TT submerged broadside
Armour	Krupp. Belt 4 in - 3 in. Bulkheads 3 in. Barbettes gunhouses and casemates 4 in. Deck ³/₄ in behind belt, 2 in abaft bulkhead. CT 10 in.
Machinery	2 sets VTE by R & W Hawthorn Leslie. 31 Belleville boilers. Designed IHP 22,000 = 23 knots. Trials IHP 22,881 = 24.01 knots.
Fuel	Coal. 1760 tons maximum.



LANCASTER as completed in 1904

Photo
NMM N1159

General

The "County" class were designed for high seas commerce protection very much in response to the fast, lightly armed French cruisers of the KLEBER class. The Admiralty proposed vessels that were to be superior in speed, armament, protection and with a better coal supply, on a displacement of 9750 tons. Sir William White as DNC produced the design following the Admiralty's brief. He would have preferred thicker armour and better armament, even if this meant increased size and cost. The ships were criticised for these deficiencies and their successors, the DEVONSHIRES, one of White's last designs for the Admiralty, were much improved. The Countys' great strengths were great endurance and high speed, being capable of maintaining 20-23 knots continuously at sea.

At an early stage in their construction the Admiralty contemplated substituting Babcock and Wilcox or Niclausse boilers for the Belleville type, but in the end made no change.

Fire controls were fitted high on the foremast and low on the mainmast about 1907. In 1916 the three main deck casemates were plated in and the guns remounted on the upper deck behind shields.

Career

3rd, and later, 4th CS Mediterranean 1904-12. 5th CS, 2nd Fleet 1912-13. 4th CS, North American and West Indies 1913-15. 7th CS, Grand Fleet 1915. Refit late 1915, then in Pacific 1916-19. Sold to T W Ward 3 March 1920, partly dismantled at Birkenhead, then to Preston for completion of scrapping.

HAMPSHIRE

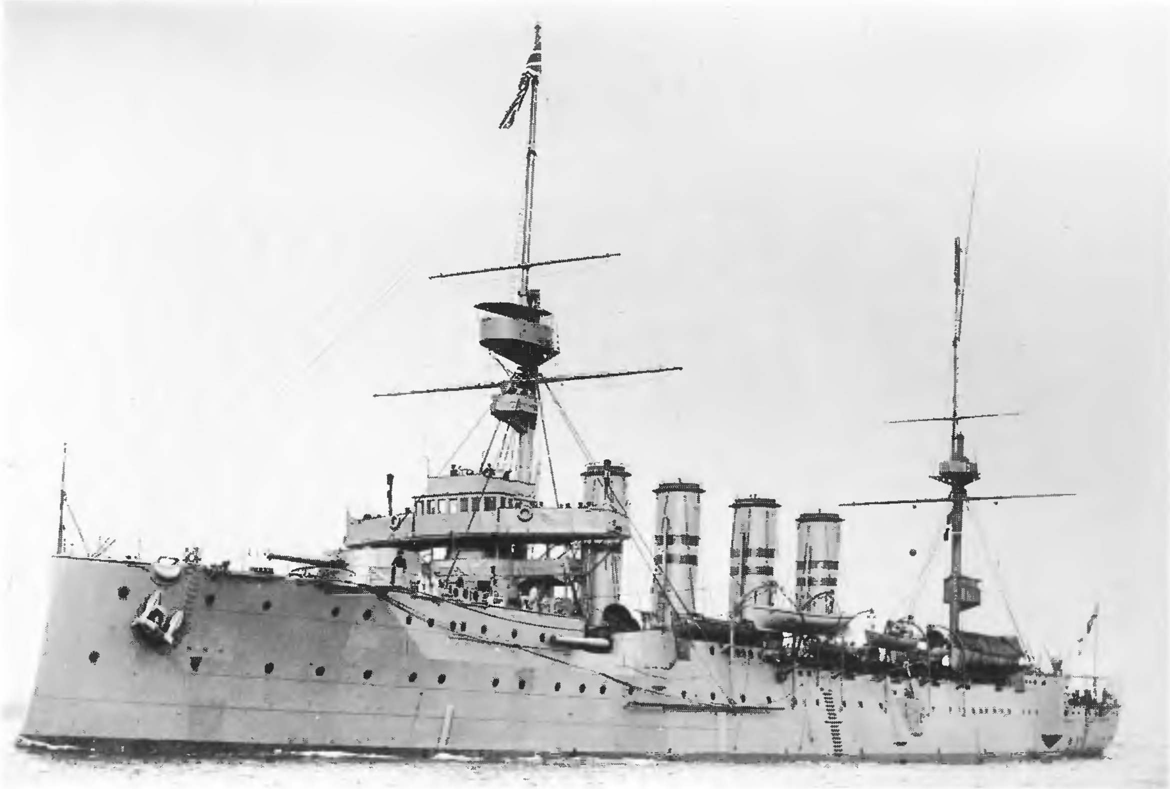
Great Britain

Yard & No	Laid down	Launched	Final trials	Designer
Elswick 734	20 Aug 1902	24 Sep 1903	19 Jul 1905	DNC

Displacement	10,700 tons
Dimensions	450 (473 ft 6 in oa) x 68 ft 4 in x 24 ft 9 in [137.2 (144.3 oa) x 20.8 x 7.5]
Armament	4 x 7.5 in BL, 6 x 6 in QF, 2 x 12 pdr, 20 x 3 pdr 2 mg. 2 x 18 in TT submerged.
Armour	Krupp. Belt 6 in - 4½ in. Bulkheads 4 - 4/2 in, aft 2 in. Deck ¾ in behind belt, 2 in outside bulkheads. Casemates fronts 6 in. CT 10 in.
Machinery	2 sets VTE by R & W Hawthorn Leslie. Boilers 17 Yarrow, 6 cylindrical. Designed IHP ND 21,000 = 23 knots. Trials IHP ND 21,508 = 23.47 knots.
Fuel	Coal. 800 tons normal, 1033 tons maximum.
Complement	610

General

HAMPSHIRE was one of the six DEVONSHIRE class, which were improved Countys, displacing an extra 800 tons and sacrificing a knot in speed to mount a heavier armament and thicker side armour. The County's twin 6 in turrets had not proved satisfactory in service, and were replaced by single 7.5 in turrets fore and aft. At a late stage the forward double-decked 6 in casemates were also replaced by single 7.5 in turrets, though four 6 in guns remained on the main deck, useless in anything of a seaway. The mixed boiler fit was adopted because cylindrical boilers were more economical when cruising, but in practice the combination was not a success. There were delays in construction because of Admiralty changes in the machinery, and also to make the alterations needed in the fore part of the ship when the decision was taken to remove the forward casemates and fit single 7.5 in turrets instead. Oil firing was contemplated for at least some boilers at one stage, but the project was dropped.



HAMPSHIRE in 1906, with fire control tops high on her foremast and low on her mainmast, and with early, non-standard funnel bands painted up. Photo : NMM N1180

Career

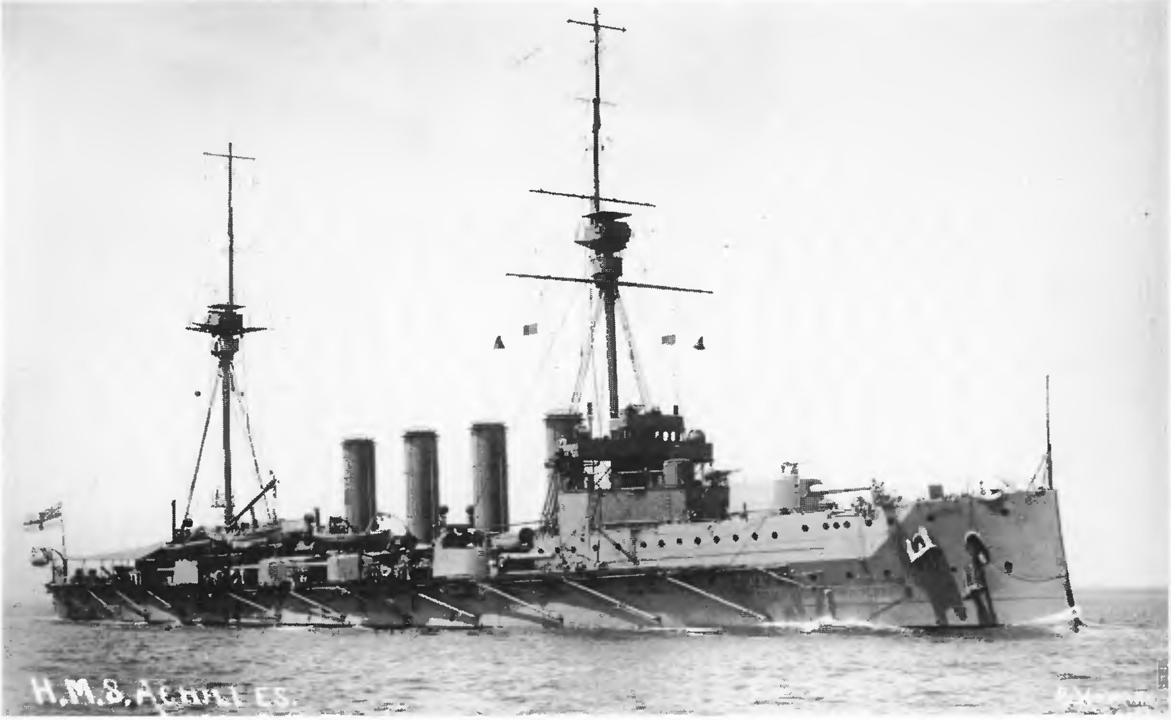
Served in the Channel, Atlantic and Mediterranean fleets from her completion to 1912, and on the China station to the outbreak of war in 1914. She spent the last month of 1914 in the Indian Ocean, searching for SMS EMDEN. When that raider had been sunk and SMS KÖNIGSBERG penned into the Rufiji river, HAMPSHIRE was recalled home to the Grand Fleet. She was sunk by a mine off the Orkneys late in the evening of 5 June 1916 shortly after leaving Scapa Flow with Lord Kitchener on board to convey him to Russia. Only 12 men survived.

ACHILLES

Great Britain

Yard & No	Laid down	Launched	Final trials	Designer
Elswick 750	22 Feb 1904	17 Jun 1905	31 Aug 1906	DNC

Displacement	13,658 tons
Dimensions	480 (505 ft 3 in oa) x 73 ft 6 in x 27 [146.3 (154 oa) x 22.4 x 8.3]
Armament	6 x 9.2 in BL, 4 x 7.5 in BL, 24 x 3 pdr QF, 2 x 12 pdr QF landing guns, mg. 3 x 18 in TT, 2 broadside, 1 stern submerged.
Armour	Krupp. Belt between main and lower deck 6 ½ in; between main and upper deck 6 in, forward 4 in, aft 3 in. Bulkheads 6 in. Barbettes 9.2 : 6 in, 7.5 : 6 in - 3 in. CT 10 in. Decks: upper 1 in, main before and above battery 1 in, lower 2 in - 1½ in - ¾ in.
Machinery	2 sets VTE by R & W Hawthorn Leslie. 19 Yarrow boilers, 6 cylindrical. Designed IHP ND 23,500 = 23 knots. Trials IHP ND 23,272 = 23.275 knots.
Fuel	Coal. 1000 tons normal, 1996 tons maximum.
Complement	768



ACHILLES entering Portsmouth in 1910, still with short funnels. Photo : NMM N1199

General

ACHILLES was one of the four WARRIOR class. They were to have been repeats of their predecessors, the DUKE OF EDINBURGH class, but the earlier ships' 6 in secondary armament carried on the main deck had proved to be unfightable in any seaway, so the ACHILLES and her sisters mounted four 7.5 in guns in single turrets on the upper deck instead. The WARRIORs were accounted the most successful of all the Royal Navy's armoured cruisers, eliminating the objectional main deck guns of earlier classes and not having MINOTAUR's crowded upper deck.

Career

Home Fleet 1907-09. Second CS Home Fleet 1909-14. Second CS Grand Fleet 1914-18. Sank the German commerce raider LEOPARD March 1917. Sold 9 May 1921 to Ward, Briton Ferry for breaking up.

CHAPTER 5
BATTLESHIPS, BATTLECRUISERS AND AIRCRAFT CARRIERS

Introduction

Armstrongs' reputation as a designer and builder of cruisers has overshadowed their record of producing battleships which were fast, well armed and well protected. Josiah Perrett, in particular, produced a number of advanced designs for South American navies, starting with the MINAS GERAES*, the first British built battleship to have superimposed turrets, and the first dreadnought with a 10 gun broadside, and culminating with the 14 gun broadside ship RIO DE JANEIRO.

Armstrongs' first battleship was the ill fated VICTORIA, laid down as RENOWN and built in 1888 to a design by Nathaniel Barnaby, Chief Constructor to the Admiralty. No further capital ships were built for the Royal Navy until the 1909 battlecruiser INVINCIBLE.

The first two battleships built for a foreign power were for Japan, both being closely modelled on contemporary British designs, as was the third Japanese battleship, the KASHIMA. HMS SWIFTSURE, built for the Chilean Navy to a basic design by Sir Edward Reed, was quite different in design and much lighter than its Royal Navy contemporaries. The Brazilian MINAS GERAES and RIO DE JANEIRO, later HMS AGINCOURT, the never completed RIACHUELO and the Chilean ALMIRANTE LATORRE and ALMIRANTE COCHRANE, later HMS EAGLE, were products of the pre-World War One South American dreadnought race.

Armstrongs benefited by orders for INVINCIBLE, SUPERB, MONARCH and MALAYA all built during the period of Anglo-German naval rivalry. COURAGEOUS, FURIOUS (and the cancelled ANSON) were built under War programmes. Armstrongs' last battleship, NELSON, was a product of the Washington Treaty.

COURAGEOUS as completed, 1917. A light battlecruiser or large light cruiser, neither fish, flesh nor fowl.
Photo : NMM N658

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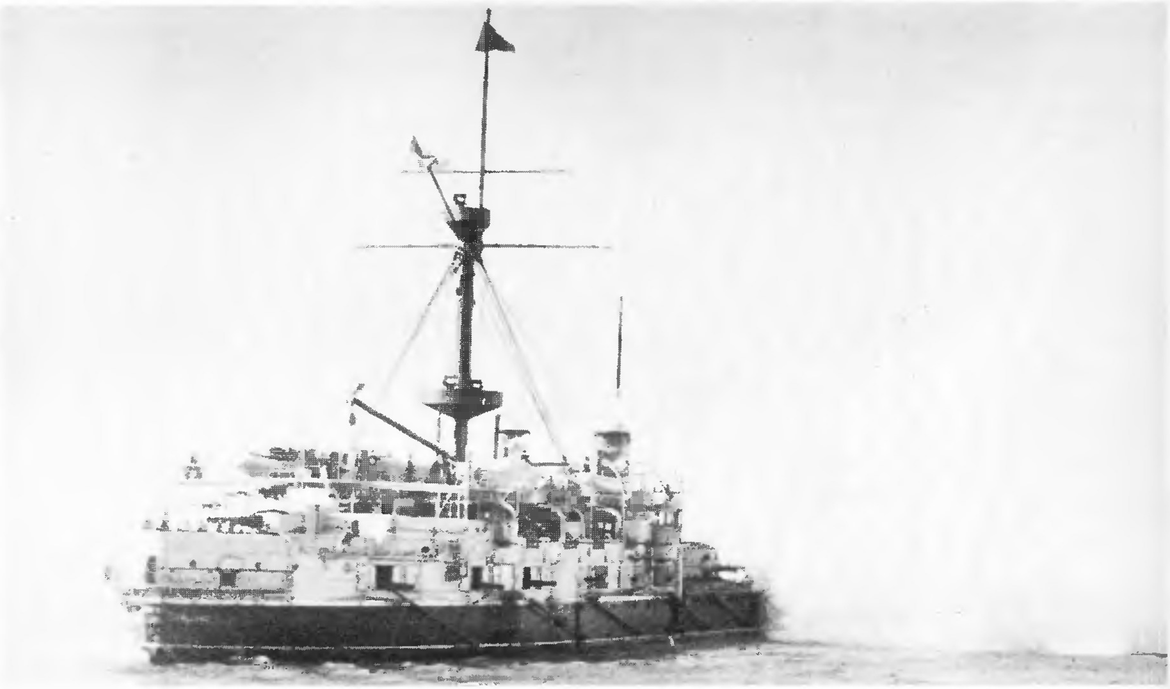
* The original spelling is used throughout, rather than the later form of MINAS GERAIS

VICTORIA
ex RENOWN
Great Britain

Yard & No	Laid down	Launched	Left Tyne	Designer
Elswick 490	30 Jul 1885	9 Apr 1887	7 Apr 1888	DNC

Displacement	10,509 tons
Dimensions	340 (359 ft 6 in oa) x 70 x 26 ft 9 in [109.6 (109.6) x 21.3 x 8.2] Freeboard forward 11 ft, aft 18 ft 10 in.
Armament	2 x 16.25 in 110 tons 30 cal BL, 1 x 10 in 27 tons 32 cal BL, 12 x 6 in 26 cal BL, 12 x 6 pdr QF, 9 x 3 pdr QF, 6 mg. 4 x 14 in TT - 2 aw bow and stern, 2 submerged broadside.
Armour	Belt 18 in. Bulkhead 16 in. Turret redoubt 18 in. 6 in battery 3 - 6 in. CT 14 in. Deck 3 in on top of belt and submerged fore and aft.
Machinery	2 sets VTE by Humphrys Tennant. 8 single-ended cylindrical boilers. Designed IHP ND 7500. FD 12,000 = 17 knots. Trials IHP ND 8038 = 16 knots. FD 14,244 = 17.5 knots.
Fuel	Coal. 900 tons normal, 1200 tons maximum.
Complement	550.



VICTORIA as completed with short funnels, firing her 110-ton guns Photo : NMM BCNG64/32

General

Early in 1885 Armstrongs were invited to tender for a first class battleship, HMS RENOWN, displacing 10,500 tons, and to develop 10,000 IHP. The total value of the contract was £604,000 with machinery and boilers costing £99,000 and the ship was to be completed in 3½ years. The first rivet was put in place at the keel-laying by Sir William Armstrong himself. Humphrys Tennant suggested increasing the IHP by 2000 giving an increase of speed to 17 knots; this was accepted by the Admiralty. Not long before her launch her name was changed to VICTORIA to commemorate the Queen's Jubilee.

Her design was dictated by the Admiralty Board, and with its single turret forward, was a retrograde step after the "Admirals". The 10 in gun aft was only incorporated at a late stage in the design process, providing a quite inadequate stern fire. As the 63 ton 13.5 in gun being developed by Woolwich would not be ready in time it was decided to arm VICTORIA and her sister-ship SANSPAREIL, with the biggest guns available, Armstrongs' 110 ton 16.25 in, and the firm was also invited to provide the 10 in gun fitted aft. She thus became the first Royal Naval battleship to be built and armed by one contractor. In the event there was almost as much delay in getting the Elswick monsters into service as the Woolwich guns, so little time was saved.

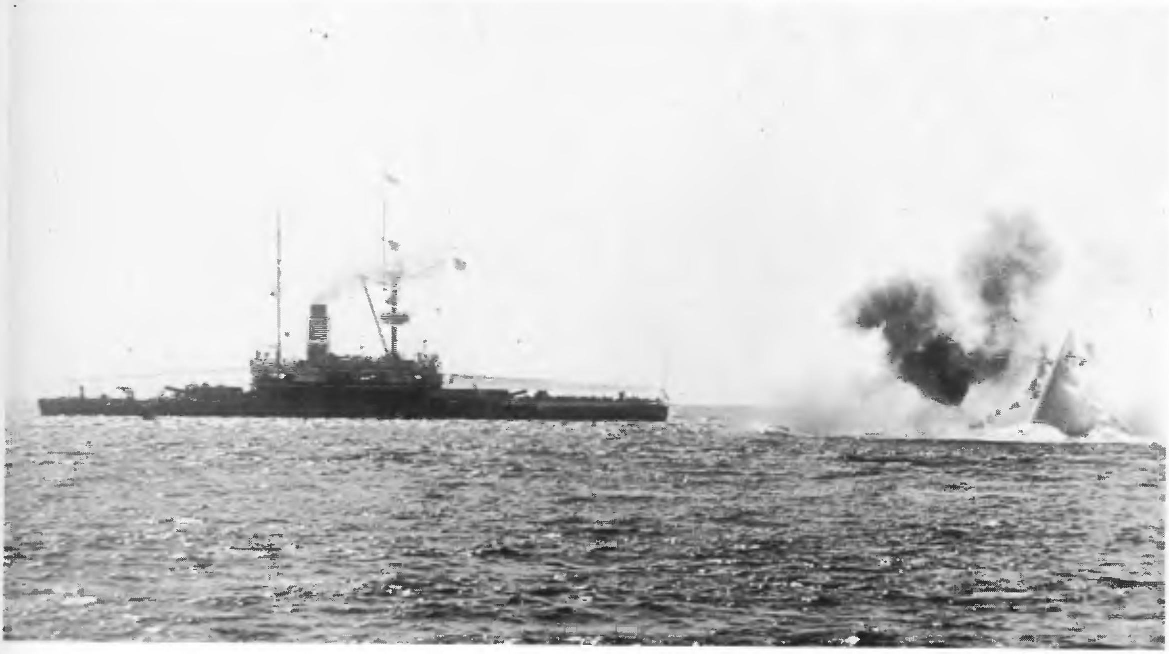
She was the biggest ship so far built at the Elswick yard, and the slip she was built on had to be specially underpinned before she was laid down. The volume of work on her also caused problems in the workshops. When complete VICTORIA was taken throught the Tyne bridges on 6 April 1888. This difficult task, made more hazardous by poorly powered tugs, was personally supervised by Phillip Watts; she was moored overnight so that she could go downstream against a rising tide, as it was judged too risky to take her down with the ebb under her. After contractors' trials she was steamed to Chatham for formal trials and to have bilge keels fitted, but returned to Newcastle for small defects to be made good. Final handover was delayed until January as the Admiralty kept asking for minor defects to be put right. However, VICTORIA was not commissioned until 19 March 1890 as her big guns initially failed under proof.

Armament

The 16.25 in guns fired a projectile of 1800 lbs with a charge of 960 lbs slow burning cocoa powder with a mv of 2087 ft/sec. Rate of fire was one round in 3 to 3½ minutes. Astern fire was provided by a 10 in, 27 ton gun firing a 500 lb projectile with a charge of 252 lbs of prismatic brown powder and a muzzle velocity of 2040 ft/sec. The mounting was identical to those in the NANIWA and TAKACHIHO.

Career & Fate

VICTORIA commissioned at Chatham 19 March 1890 to go out as flagship of the Mediterranean fleet. While cruising with the Fleet in Greek waters she grounded at Snipe Point, Platea on 29 January 1892, only being got off on 4 February. Repaired at Malta she resumed her command in May. The Commander in Chief was Vice Admiral Sir George Tryon, noted as a master of intricate formal evolutions and for being an autocrat. Off the Syrian port of Tripoli on 23 June 1893 manoeuvring to bring the fleet to anchor off the port he ordered his two columns of battleships to turn inwards in succession where there was insufficient distance between them; despite his flag captain and staff commander pointing out the risk, he persisted in repeating his order. His flagship was rammed by HMS CAMPERDOWN, wearing the flag of Rear Admiral Markham, who although clearly recognising the danger nevertheless carried out the order after receiving a semaphore signal asking what he was waiting for.



The end of the VICTORIA. Her keel and her two screws can be seen under the smoke cloud. To her left is the battleship NILE. The photo was taken by Staff Surgeon Collot from the COLLINGWOOD.

Photo : NMM N5318

The order to close watertight doors was given in VICTORIA only a minute or so before impact, which was too short a time for the ship to be closed down. With her low freeboard VICTORIA's forecastle was soon below water which flooded in through the battery doors and turret gun ports. Within a short space of time she rolled over and sank with great loss of life including Admiral Tryon.

The Court Martial found that the collision was due to an order given by Sir George Tryon "to the two divisions in which the fleet was formed to turn 16 points inwards, leaders first, the others in succession, the columns at that time being only six cables apart". Because the turning circles of the VICTORIA and CAMPERDOWN were 800 yards the minimum safe distance between the columns was eight cables. The court further found that "although it is much to be regretted that Rear Admiral Albert Hastings Markham did not carry out his first intention of semaphoring to the Commander-In-Chief his doubt as to the signal, it would be fatal to the best interests of the service to say he was to blame for carrying out the directions of his Commander-In-Chief present in person".

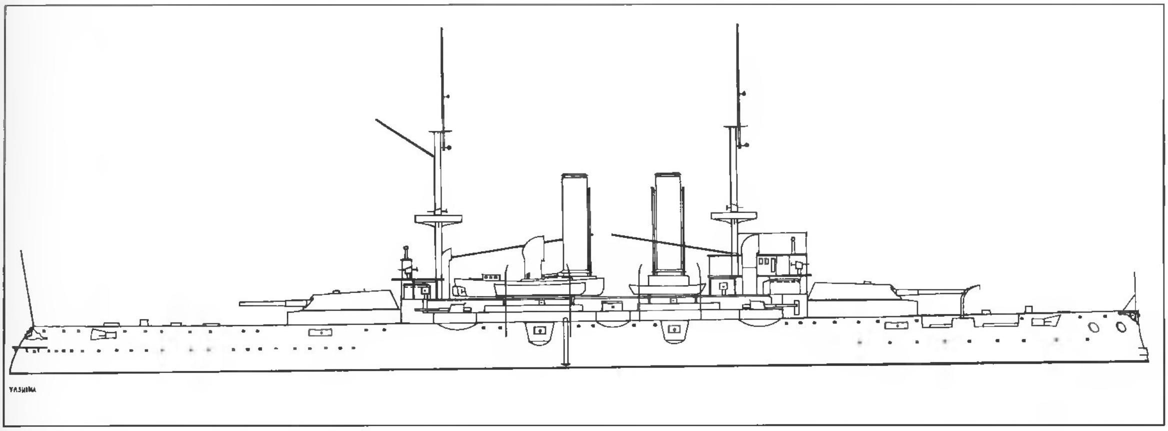
A subsequent Admiralty Minute, based on investigations made by the DNC Department, concluded that if all doors and other openings had been closed VICTORIA would have retained adequate stability, would not have capsized and the ship would have been saved. The Minutes exonerated both the designer and the constructors by concluding that the general structural arrangements of the VICTORIA "did not by any fault of principle contribute to the loss of the ship, but that on the contrary had the water tight doors, hatches and ports been closed the ship would have been saved, nothwithstanding the crushing blow which she received from the CAMPERDOWN".

YASHIMA

Japan

Yard & No	Laid down	Launched	Final trials	Designer
Elswick 625	6 Dec 1894	8 Feb 1896	14 Sep 1897	Phillip Watts

Displacement	12,330 tons. 12,264 tons on trials.
Dimensions	372 (400 wl, 412 oa) x 73ft 6in x 26ft 3in [113.4 (121 wl, 125.6 oa) x 22.4 x 8.0] Freeboard forward 19 ft 6 in, amidships 17 ft 6 in, aft 18 ft 3 in.
Armament	4 x 12 in 40 cal BL, 10 x 6 in 40 cal QF, 14 x 3 pdr QF. 10 x 2½ pdr QF. 5 x 18 in TT, 1 aw bow, 4 submerged broadside.
Armour	Harvey. Belt 18 in. Bulkheads 14 in. Lower deck side 4 in. Barbettes 14 - 9 - 5 in. Hoods 6 in max. Casemates 6 in - 2 in. Deck 2½ in flat on top of belt.
Machinery	2 sets VTE by Humphrys Tennant. Boilers 10 cylindrical. Designed IHP ND 10,000 = 16.75 knots. FD 13,500 = 18.25 knots. Trials IHP ND 9570 = 17.26 knots. (6 hours). 17.7 knots on measured mile. FD 14,075 = 19.227 knots. (3 hours).
Fuel	Coal. 700 tons normal, 1620 tons maximum.
Complement	650



YASHIMA 1897

General

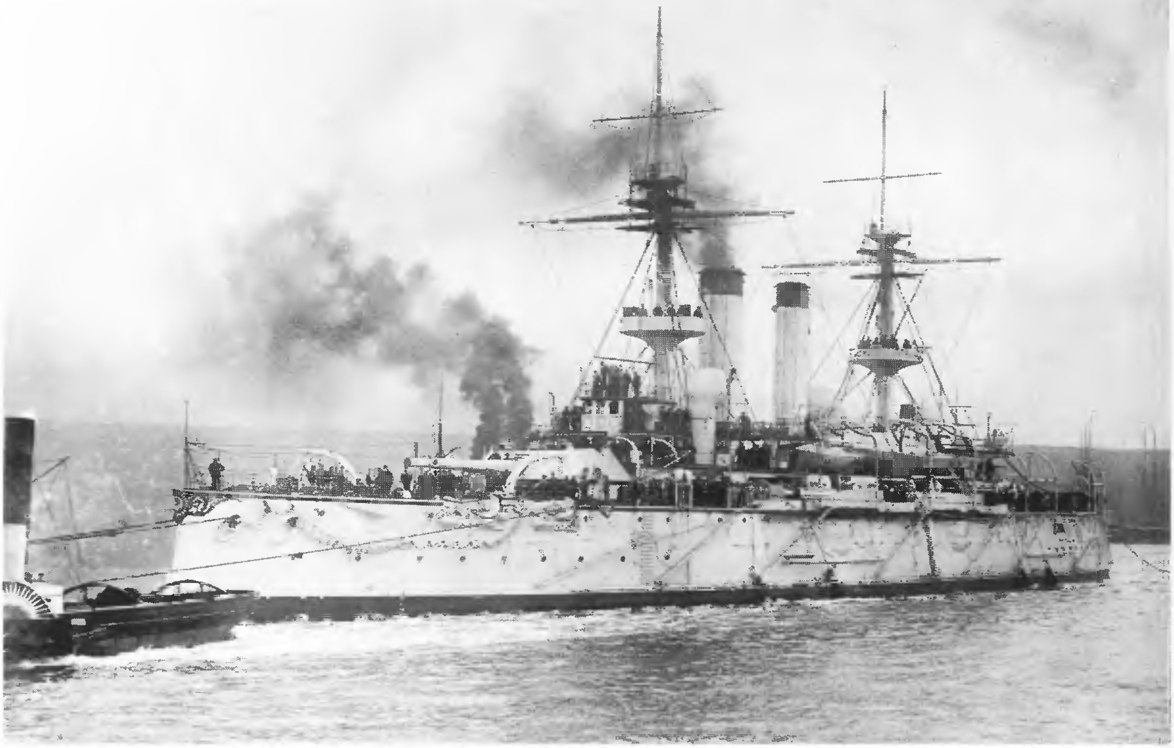
YASHIMA and her near sister FUJI were ordered by Japan under the 1894 programme just before the outbreak of the Sino-Japanese War. In January 1894 Armstrongs were invited to provide designs for, and to tender for building one or two battleships of 14,900 tons. In August a successful tender was made for a battleship to displace about 12,000 tons. Although the Yard Report Book implies that the design was their own, there must have been close collaboration between Elswick and G C Mackrow, naval architect to the Thames Iron Works, as FUJI was almost identical to YASHIMA. The two ships were smaller and improved versions of the ROYAL SOVEREIGNs. They mounted the new, longer and lighter 12 in guns in place of the ROYAL SOVEREIGNs' 13.5 in, and their barbettes, still pear-shaped rather than circular, were covered with an armoured hood protecting the gun breeches and crews, instead of, as in the earlier ships, a flat shield which left the breeches exposed when in the firing position and which was proof against machine gun fire only. The mountings were an Elswick design, the same as those carried in the first five MAJESTICs. Though full all-round loading was not possible, a rammer and bogie were contained in the overhang of the armoured hood, and with 18 shells stowed on racks in the revolving structure and charges coming up through a central hoist, a limited amount of firing on any bearing was possible, the guns only having to return to a fixed loading elevation of 1 degree. As in the ROYAL SOVEREIGNs as built, four 6 in guns were mounted in casemates on the main deck, the other six in shields on the upper deck.

The ROYAL SOVEREIGNs had compound armour, while YASHIMA and FUJI had Harveyed steel. Even so, the maximum thickness of the 8 foot deep main belt was the same, 18 ins. The barbettes were also at 14 ins, extremely thick and heavy. Perhaps either the designer or the Japanese drawing up the specification were not aware of the greater protective power of the Harveyed plate or the thickness was established before Harveyed armour was substituted for compound.

YASHIMA's engines had cylinders of 40 in, 59 in and 88 in bore diameter, with a stroke of 45 ins. Her 10 single-ended return tube cylindrical boilers were in four compartments. Uniquely, the deadwood aft was removed. This made her very manoeuvrable, but led to problems in docking, where the unsupported after section tended to sag if not carefully shored. She was a knot faster than her sister, and 1½ knots faster than the ROYAL SOVEREIGNs.

She could be distinguished from FUJI by their ventilators; YASHIMA having but four very large cowls, FUJI having more numerous and smaller cowls.

In 1901 she was refitted, the 3 pdrs, except for those in the fighting tops, being replaced by 3 in, 12 pdrs.



YASHIMA being brought down the Tyne from Elswick for trials, summer 1897 Photo : UNT

Career

Japan offered to place YASHIMA and FUJI at the disposal of the Admiralty at the time of the Anglo-German crisis in 1896. The offer was not taken up.

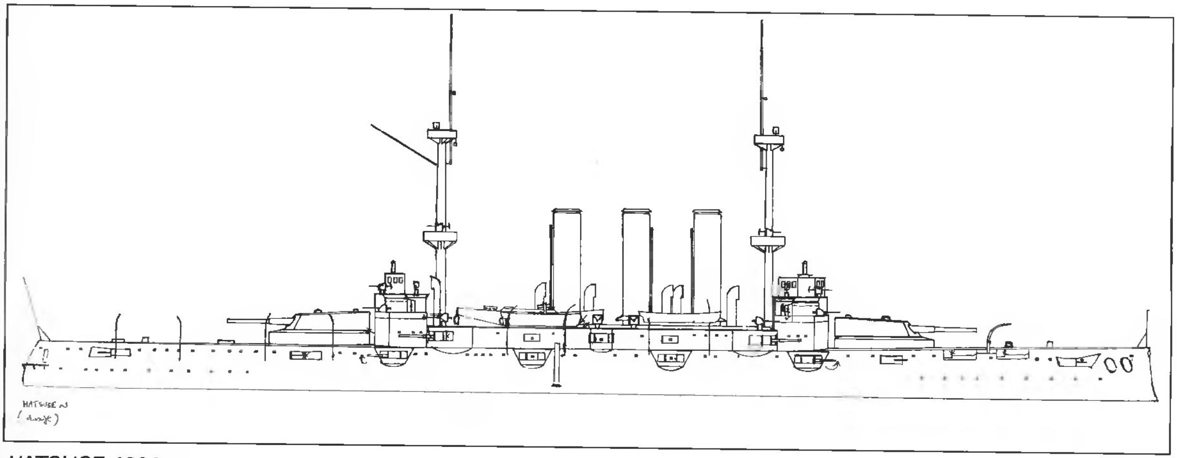
At the outbreak of the Russo-Japanese War YASHIMA formed part of the First Division, which included all six of Japan's battleships (not counting the old ex-Chinese CHIN YEN). On 9 February 1904, the morning after the first torpedo attack on Port Arthur, she and the rest of the First Division bombarded the Russians lying outside the port, the first of many such occasions. On 15 May, HATSUSE, YASHIMA and SHIKISHIMA were patrolling between 10 and 15 miles south of Port Arthur when they entered a minefield laid in international waters by the Russian minelayer AMUR the previous day in fog. At 1050 first HATSUSE then a few minutes later YASHIMA struck mines. Both were quickly taken in tow, but at 12.33 HATSUSE struck a second mine exploding a magazine; she blew up and sank in two minutes. YASHIMA remained under tow making for the Elliott Islands base, but she slowly filled with water, and had to be anchored near Encounter Rock, where she developed an increasing list. Her crew took a ceremonial farewell of her, and she rolled over and sank. Her loss was concealed from the outside world for several months.

HATSUSE

Japan

Yard & No	Laid down	Launched	Trials	Designer
Elswick 680	10 Jan 1898	27 Jun 1899	18 Jan 1901	Phillip Watts

Displacement	14,312 tons normal.
Dimensions	400 (439 ft 8 in oa) x 76 ft 6 in x 26 ft normal, 27 ft 4⅝ in deep. [121.9 (134.01 oa) x 23.3 x 7.92 normal, 8.34 deep] Freeboard 21 ft 9 in forward, 17 ft amidships, 18 ft 6 in aft.
Armament	4 x 12 in 40 cal BL, 14 x 6 in 40 cal QF, 20 x 3 in QF, 8 x 3 pdr QF,4 x 2½ pdr QF. 4 x 18 in TT submerged broadside.
Armour	Harvey-Nickel. Belt 9 in - 4 in. Lower deck sides 6 in. Bulkheads 14 in. Barbettes 14 in maximum. Hoods 10 in maximum, 3 in crowns. Casemates 6 in fronts, 2 in back. CT forward 14 in, aft 3 in. Deck 4 in slope, 2½ in flats reinforcing belt, 2½in slopes and flats at ends.
Machinery	2 sets VTE by Humphrys Tennant. 25 Belleville boilers. Designed IHP ND 11,600. FD 14,500 = 18 knots. Trials IHP FD 16,117 = 19.11 knots at 14,500 tons.
Fuel	Coal. 700 tons normal, 1643 tons maximum.
Complement	849 as flagship

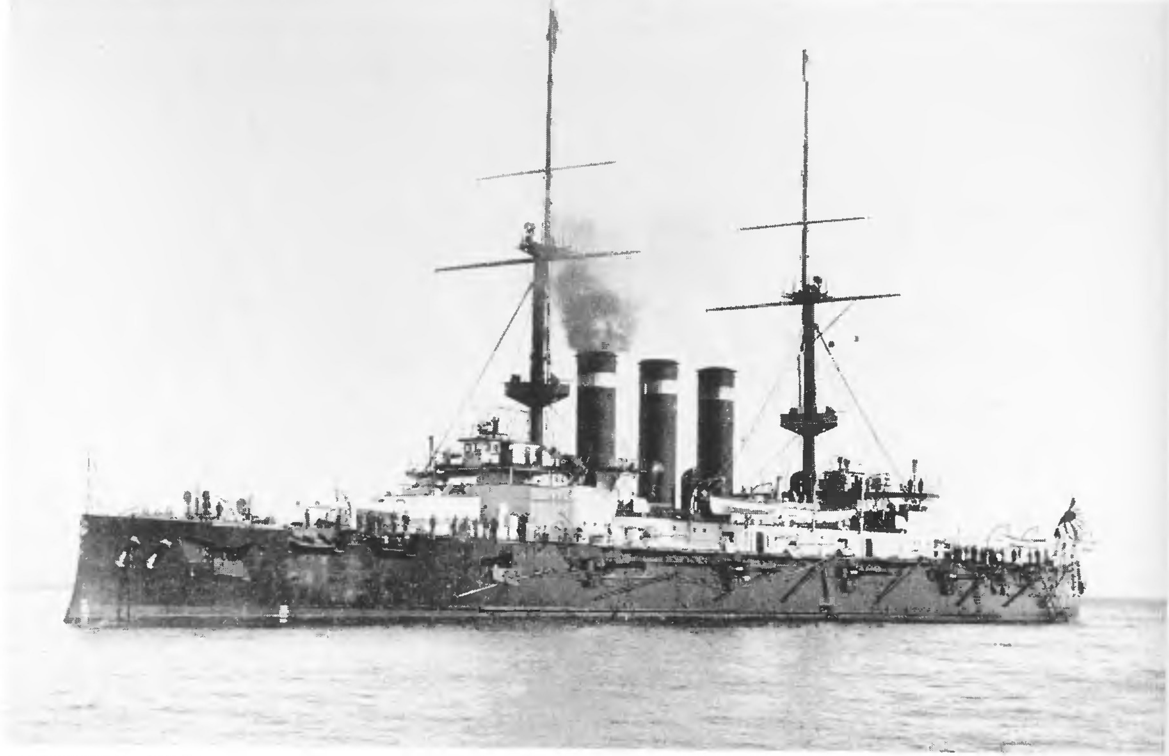


HATSUSE 1901

General

HATSUSE and her three near sisters (SHIKISHIMA, ASAHI and MIKASA - all British-built) were laid down under the 1896 "Ten Year Naval Expansion Programme", which also included six armoured cruisers, four of which were constructed by Armstrongs, and a number of small craft. The programme was made feasible by the £30 million received from China, under the terms of the treaty of Shimonoseki which ended the Sino-Japanese War. Nearly £5 million of the indemnity paid to Japan was compensation for giving up rights to Port Arthur and the Liao-Tung Peninsula: this was done under pressure from the Russian, French and German Governments. The resulting loss of face was compounded by Russia acquiring all of this territory in 1898, while at the same time exerting powerful influence in Korea and moving into Manchuria. Russia's expansionist policy was the single most important factor in Japan's massive armament programme.

HATSUSE was modelled closely on the contemporary British battleships of the FORMIDABLE class. She was however a knot faster, mounted two more six in guns, had thicker belt armour at the ends, thicker barbettes and barbette hood armour; in compensation the upper belt was only 6 in, as compared with FORMIDABLE's 9 in, while maximum coal capacity was 560 tons less. Originally designed with a bow torpedo tube, this was omitted at the request of the Japanese.



HATSUSE in 1902 in the short-lived black and white livery. Photo : Author's collection

Armament

The main armament of 4 x 12 in guns was mounted in two hooded barbettes. All-round loading was achieved by a pair of revolving hoists running from magazine and shell room to the gun house with a fixed loading angle of 13 $^1/_2$°. There was no break at working chamber level with the result that there were delays if the guns were firing continuously. In addition there were a pair of shot hoists reaching from the shell room to the rear of the gun shield, which could deliver or pick up shot from the working chamber. With this arrangement, shells and cordite went into the bogie at the rear of the gunshield, and were hand rammed. The alternative cordite supply was provided by a pair of hoists reaching from the magazine to a platform placed between the two guns. Power for the main hoist and training was hydraulic and alternatively electric, while the secondary loading arrangements were hydraulic or hand. If all power failed shells and cordite could be hoisted up by hand tackle. HATSUSE's gun mountings incorporated port protectors for the first time.

The secondary armament of 14 x 6 in QF was mounted six in upper deck casemates and eight on the main deck.

Armour

Belt and barbette armour was of Harvey Nickel steel. The 8 ft wide complete water line belt had a height of 3 ft 7$^3/_8$ in above water and 4 ft 4$^5/_8$ in below, at normal draft. The thickness was 9 in for a central portion of 220 ft with 4 in ends and was surmounted by a 6 in thick citadel, 220 ft in length. The oblique bulkheads running from the end of the thick belt to the barbettes were 14 in to 12 in, and at lower deck level were 6 in. The barbettes had a maximum thickness of 14 in thinning to 10 in at lower deck level. The deck reinforced the belt: the flat portion amidships was 2$^1/_2$ in thick and was 3 ft 5$^1/_2$ in above the water line while the slope was 4 in to a depth of 4 ft 7 in. Outside the thick belt the below water line deck was 2$^1/_2$ in on the flat and 2 in on the slope.

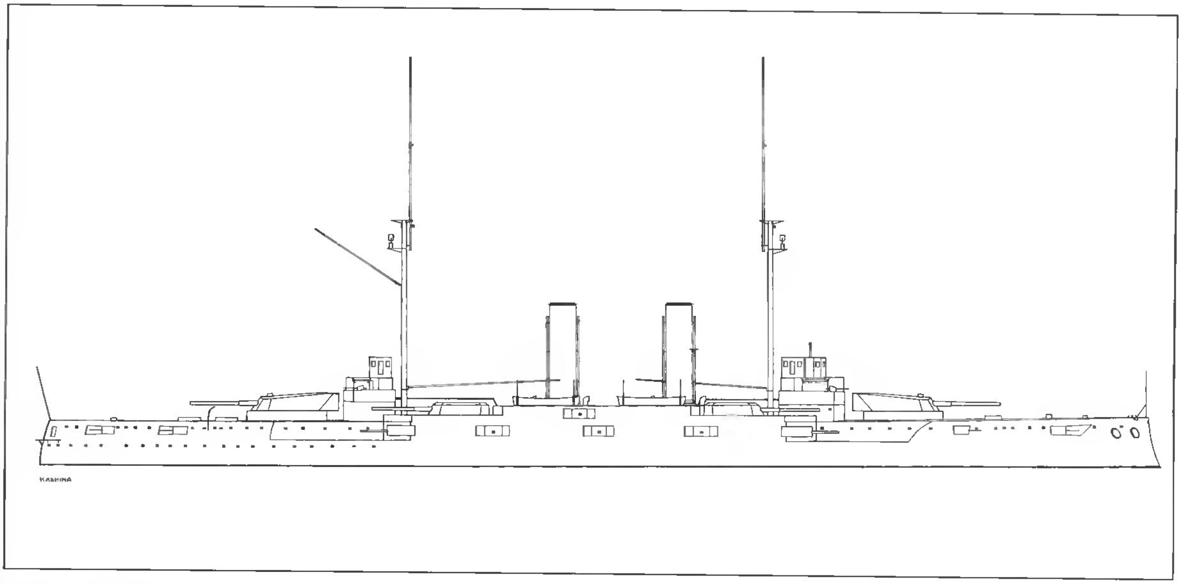
Career
HATSUSE remained in Britain after completion representing the Emperor at the funeral of Queen Victoria. At the outbreak of the Russo-Japanese War, she flew the flag of Rear Admiral Nashiba commanding the Second Subdivision, First Division, First Squadron which took part in the blockade of Port Arthur, bombarding the port and forts on several occasions.

She was in company with YASHIMA on 15 May when both were mined, as described in the section on YASHIMA.

KASHIMA
Japan

Yard & No	Laid down	Launched	Final trials	Designer
Elswick 755	29 Feb 1904	22 Mar 1905	31 May 1906	J R Perrett

Displacement	16,383 tons.
Dimensions	425 (455 wl, 470 oa) x 78 ft 2 in x 26 ft 7½ in [129.54 (138.68 WL 143 25 oa) x 23.81 x 8.12] Freeboard 19 ft 6 in forward, 17 ft amidships, 18 ft 2¼ in aft.
Armament	4 x 12 in 45 cal 59 ton BL, 4 x 10 in 45 cal 34 ton BL, 12 x 6 in 45 cal QF, 12 x 12 pdr QF, 3 x 3 pdr QF, 6 mg. 5 x 18in TT, 1 stern and four broadside submerged.
Armour	Krupp. Belt 9 in - 2½ in. Lower deck side 6 in. Battery 6 in. Upper battery 4 in. 12 in barbettes: 12 in - 5 in, hoods 9 in. 10 in barbettes: 6 in, hoods 8 in - 6 in. Deck amidships 3 in slopes, 2 in flats; ends 2½ in. Main deck forward 1 in. CT 9 in.
Machinery	2 sets VTE by Humphrys Tennant. 20 Niclausse boilers. IHP ND 15,600 = 18.5 knots. 8 hour full power trials IHP 17,280 = 19.242 knots at full load. 24 hour 4/5ths power ie, continuous sea speed = 18 knots.
Fuel	Coal 750 tons normal, 2150 tons maximum.



KASHIMA 1906

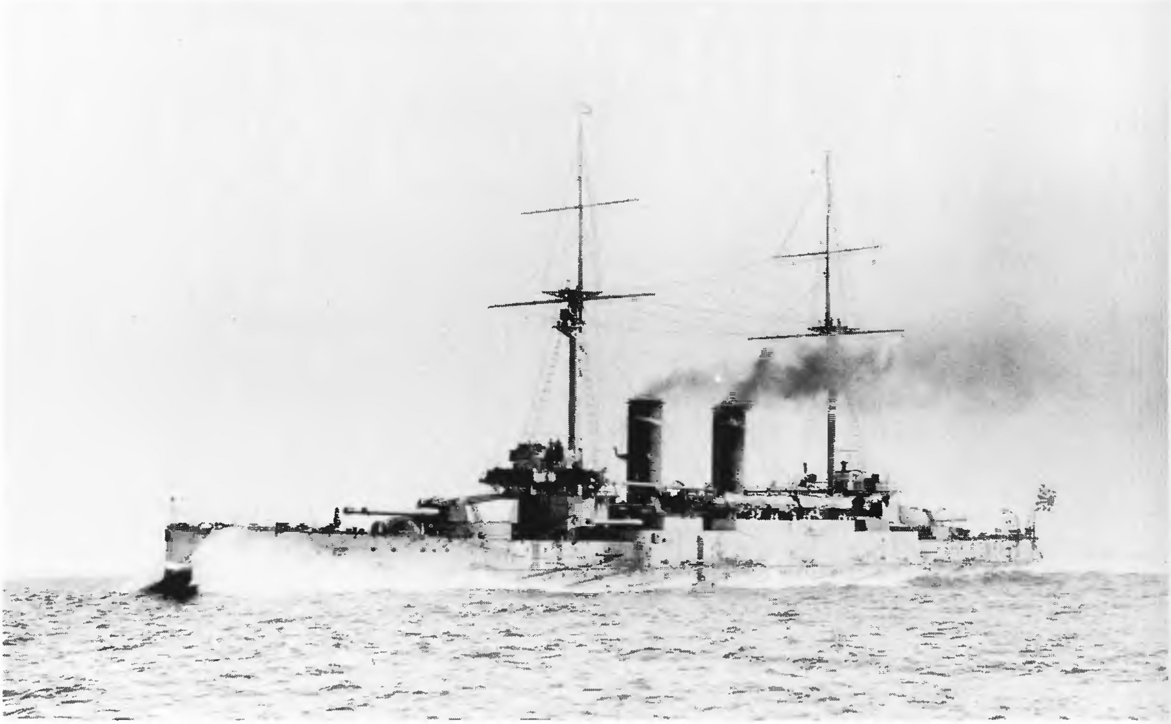
General

In the 1903 programme, the Japanese government authorised the procurement of two more battleships. Armstrongs submitted designs and tenders in September 1903 and the order was received in January 1904. A very similar but slightly smaller vessel, the KATORI, was built by Vickers. They were similar to their Royal Navy near contemporaries of the KING EDWARD class but carried two more six in guns, the 12 in guns were 5 calibres longer and she carried 10 in guns firing a 500 lb shell compared with the KING EDWARDs 380 lb, 9.2 in shell. In compensation KASHIMA's lower deck side armour was 2 in thinner.

There was a complete Krupp steel armour belt 9 in in thickness amidships with a depth of 5 ft below and 2 ft 6 in above water. Above this there was a 6 in thick citadel and battery rising to the upper deck, ie, about 15 ft high, running between and enclosing, the two main barbettes. Between the 10 in turrets there was a 7 ft 6 in high, 4 in thick armour screen, with one six in gun on each side behind it. The 6 in guns in the main battery were not mounted in casemates but behind the side armour with 2 in screens between each gun. They were 14 ft above water as compared with 12 ft 9 in in the KING EDWARD class so were marginally less affected by heavy seas and by the ship's roll.

As completed she had only searchlight platforms at her lower mastheads. About 1912 she was fitted with an enclosed fire control top on her foremast. When employed as a training ship 1919-21 she had her after bridge greatly enlarged.

Apart from the battlecruiser KONGO, built by Vickers 1911-13, she was the last major Japanese warship to be built abroad.



KASHIMA at speed during trials, May 1906 Photo : UNT

Career

She was completed too late to take part in the Russo-Japanese War. She suffered an explosion in one of her 10 in turrets on 16 September 1907. She played no significant part in World War One. In August 1918 she formed part of Vice Admiral Arina's Third Squadron which was sent to cover the Japanese army in its operations in Siberia against the Bolsheviks. In 1921, she and KATORI formed a training squadron, visiting Malta, France and England in the course of a world cruise.

She was disarmed at Maizuru in April 1922, stricken in 1923 under the terms of the Washington Treaty and broken up in 1924-25 in Nagasaki.

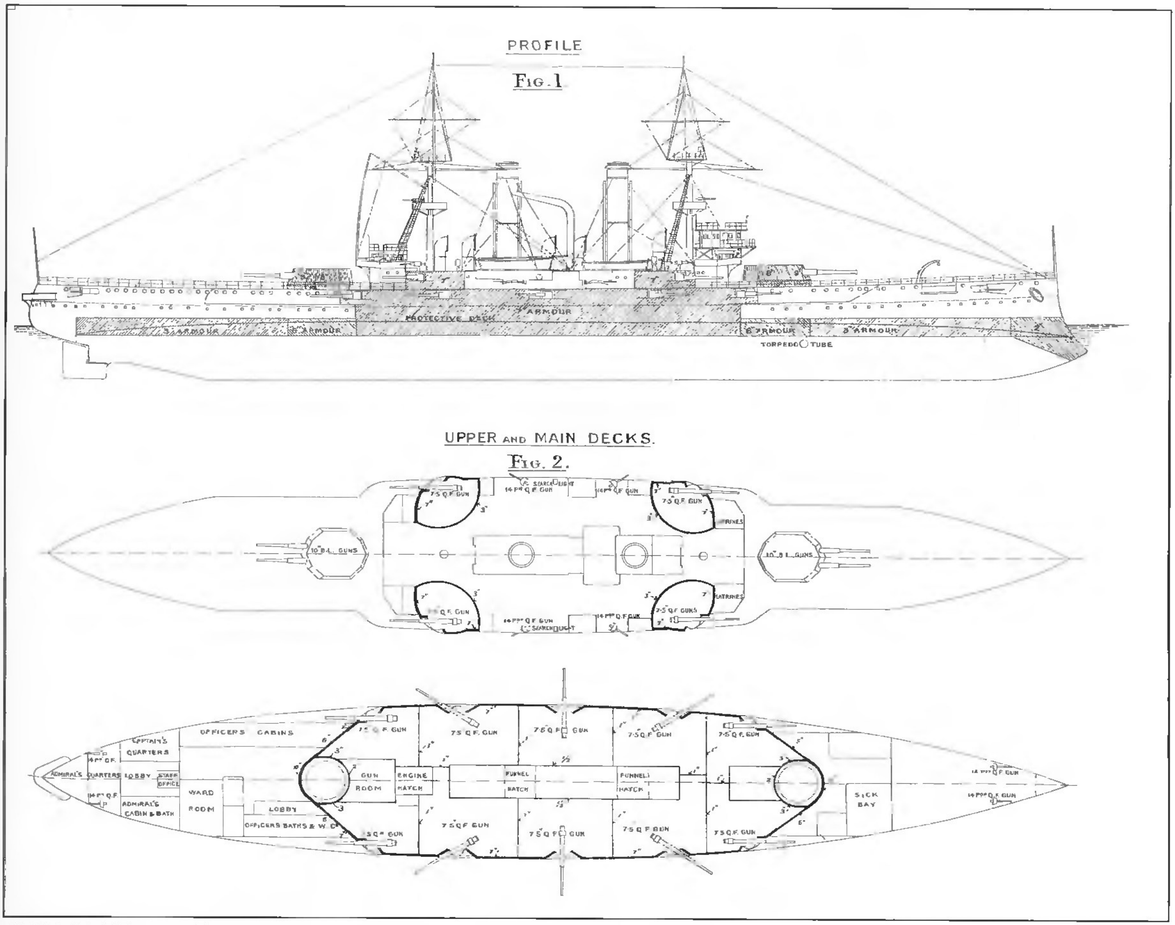
SWIFTSURE

ex CONSTITUCION

Chile, then Great Britain

Yard & No	Laid down	Launched	Final trials	Designer
Elswick 733	22 Mar 1902	13 Jan 1903	15 Jun 1904	J R Perrett (from a preliminary design by Sir Edward Reed)

Displacement	11,853 tons normal designed. Actual 12,175 tons. Deep 13,840 tons.
Dimensions	436 (475 ft 3 in oa) 71 ft 1¼ in x 24 ft 7½ in (26 ft 5¾ in deep) [132.9 (144.86) x 21.64 x 7.5) 8.06 deep)]
Armament	4 x 10 in 45 cal BL, 14 x 7.5 in 45 cal BL, 14 x 14 pdr QF, 2 x 12 pdr landing guns, 4 x 6 pdr QF, 4 x 37 mm pom pom, 4 mg. 2 x 18 in TT, submerged broadside.
Armour	Krupp. Belt 7 in - 6 in - 3 in. Upper belt 7 in. Battery 7 in, 1 in screens, Casemates (4) 7 in fronts - 3 in rear. Barbettes 10 in - 3 in - 2 in, hoods 10 in - 8 in. Deck 1½ in reinforcing belt inside citadel, 3 in outside citadel. 1 in roof to 7.5 in battery. CT 11 in.
Machinery	2 sets VTE by Humphrys Tennant. 12 Yarrow boilers. Designed full power IHP 12,500 = 19 knots. Trials IHP 14,000 = 20.05 knots.
Fuel	Coal. 850 tons normal, 1200 tons maximum. Radius 6250 miles at 10 knots.
Complement	802



SWIFTSURE and TRIUMPH as fitted, plan published in Trans INA 1904

South American Politics and Naval Armaments

From about 1870 Argentina and Chile had a long-running dispute about the boundaries of Patagonia; problems began when it was discovered that this bleak southernmost part of the South American continent was rich in phosphates and coal. After a patched up solution had been reached in 1876, tension subsided but again worsened in the late 80s. We have seen how Armstrongs' profited from the sale of three protected cruisers to each of the two countries. Chile established its superiority by having a second class battleship – French built – launched in 1890, and increased her lead with the two Armstrong built armoured cruisers described earlier, but Argentina took a commanding position when, between 1895 and 1898 she acquired four GARIBALDI class armoured cruisers from Italy, these forming a homogenous squadron.

In 1899 a temporary solution to part at least of the boundary question was achieved, but the dispute flared up again so that by the end of 1901 the two countries were on the brink of war. Argentina ordered two more GARIBALDIs and asked Ansaldo, their builders, for designs for two 22 knot 15,000 ton battleships armed with 12 in guns. In November of that year Sir Edward Reed, a former Chief Constructor of the Admiralty and more recently Chile's consultant on warship design, happened, in his own words, "to visit Chile at that time for the benefit of my health" and was commissioned to design two fast battleships. In discussion with Vice Admiral Montt, Director General of the Chilean Navy and previously President of the Republic from 1891-96, Reed produced outlines for an 11,000 ton ship of 19 knots with two pairs of barbette-mounted 10 in guns fore and aft. Four 7.5 in guns were to be mounted on the upper deck and either six 7.5s in turrets on the same deck or, failing this, eight 7.5 in guns on the main deck. Shortly after Reed had returned to England the Chileans requested a secondary armament of fourteen 7.5 in, which made it necessary to mount ten of these on the main deck. The limited displacement was determined by costs, while the dimensions and proportions were constrained by the necessity for the pair to be able to go into the graving dock at Talcahuano with sufficient clearance for the hulls to be cleaned and repaired.

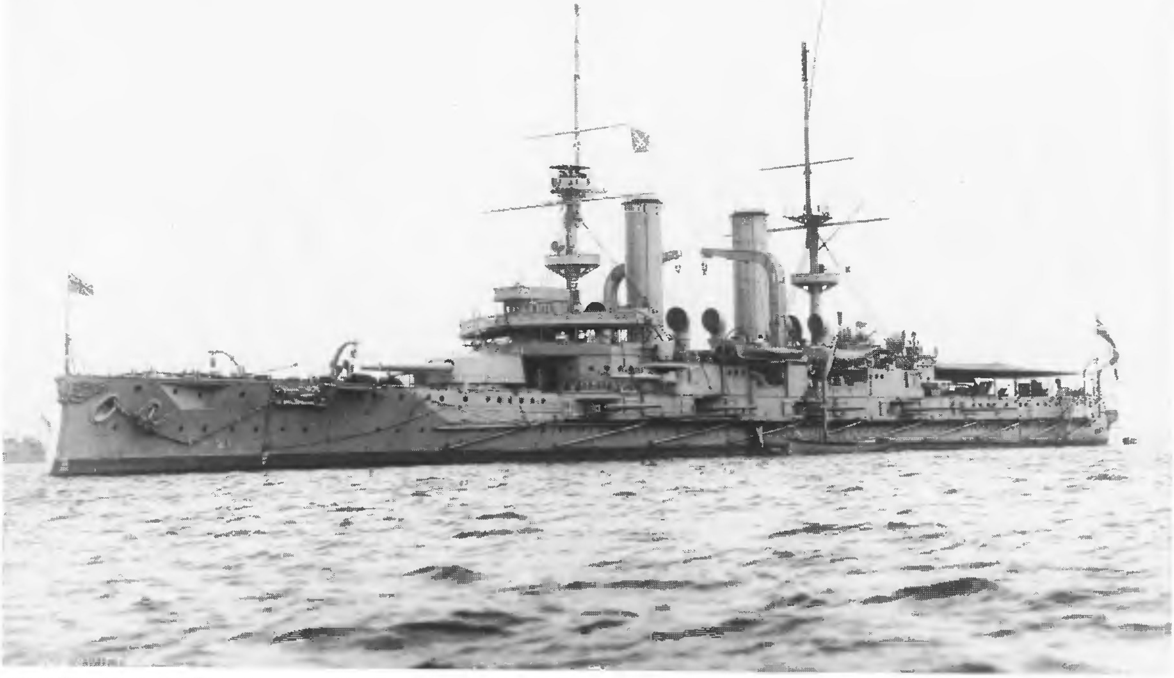
On Reed's return to London in February 1902 he gave instructions to Armstrongs' and Vickers for drawings to be prepared, although these had to be modified because of the increase of the secondary armament. Representatives of both firms met at Reed's office to see what modifications were required; eventually identical drawings and specifications were produced, contracts for the ships being placed only three weeks after Reed had landed in England, CONSTITUCION going to Armstrongs and LIBERTAD to Vickers.

By 1902 Great Britain, alarmed by the effects of South America war, offered her good offices to find a solution, and in May 1902 agreement was reached on the limitation of naval armaments and the renunciation of territorial expansion. In consequence, Chile put her two ships LIBERTAD and CONSTITUCION on the market and Argentina sold her pair of armoured cruisers to Japan on the eve of the Russo-Japanese war. The naval race had ended, but only for a few years, as by 1910 it had restarted but this time involving dreadnoughts and including Brazil.

General

When first offered for sale at a cost of £1,100,000 each (building cost of CONSTITUCION exclusive of armament was £652,291) the Prime Minister, A J Balfour, declared that they were not suitable for Admiralty purposes, and that it was not advisable to buy them. However, by November 1903 the government decided to buy them, the reason given by Austen Chamberlain, the Chancellor of the Exchequer, was that the price for the pair was some £400,000 less, in addition if the two battleships were added to the strength of another country this might seriously disturb the balance of naval power. The real reason for the purchase was that Russia had offered Chile £1,870,000 for the pair in November 1903. Three months previously Japan had offered £1,600,000 for both, not so much to strengthen her battlefleet, as the two ships would not take Japanese ammunition, but to prevent them falling into Russian hands. The British cabinet agreed to offer £1,875,000 on 27 November 1903, to prevent them falling into Russian hands, but without seeming to assist Japan too much. The offer was accepted on 2 December 1903 but on the 15th of that month Japan asked whether Britain would permit them to buy the pair, but this was refused, as the Russians would regard this as a hostile move.

The purchase attracted a mixed reception. For example, the Times in December 1903 thought the Admiralty were well advised to buy the battleships at the comparatively low price and avoid a possible disturbance in the balance of naval power. An anonymous "correspondent" in the same paper was sharply critical of their design; he believed that the long 7.5 in guns would dip their muzzles into the sea with a moderate heel in smooth water, while they would be quite unworkable in weather of moderate severity. Because of limited freeboard forward, their speed would be affected by seas breaking over the forecastle. The correspondent thought that the design of the CRESSY had greatly influenced that of the Chilean battleships, but their IHP was 40% less, they were not sheathed, and they had no high forecastle. He cast considerable doubt as to whether the 7.5 in guns could, as reported, fire eight times in a minute. Was Sir William White, Reed's old adversary, the author of the article? There were further criticisms in Parliament, as, during the debate on the 1904 estimates, Lord George Hamilton, a previous First Lord, had commented on the ability of private ship builders to get more guns, armament and machinery into their designs. The Secretary to the Admiralty compared TRIUMPH with HMS DUNCAN. All aspects of the design had to be taken into account, as on a displacement of about 2,000 tons more than the Chilean ship, DUNCAN carried 234 more tons of equipment, an additional 20 tons of armament, 595 tons of machinery, 580 tons of armour, 100



SWIFTSURE in 1906, with rangefinder in roofed platform at foremasthead Photo : IWM Q40250

tons of coal and 770 tons for the hull. TRIUMPH's lighter machinery would be less robust and being fast running was less desirable in a battleship.

Sir Edward Reed sprang to the defence of his ships by presenting a paper during the meeting of the Institution of Naval Architects in 1904, maintaining that it was no advantage for ships to have heavier hull or machinery than necessary. He produced a table which purported to show that the Chilean pair were superior to DUNCAN, but here he attracted much criticism as he did not compare broadside with broadside, but half of each ship's armament; an Admiral in the audience was quick to point out that in ship to ship combat all the big guns would be directed at the opponent. Doubts were also raised about Reed's very high figures for muzzle velocity which he later had to modify. Sir William White in the discussions afterwards, emphasised the TRIUMPH's close correspondence in dimensions to the CRESSY, insisted that 10 in instead of 12 in guns made them second class battleships only, and strongly criticised the main deck mountings, saying that this practice had now been abandoned in the Royal Navy.

Armament

Elevation, training and breech working were by hydraulic mechanism. Because of the lighter weight of the ammunition the supply was simpler and more efficient than with the 12 in mountings. There was a gun loading cage for each gun, with a shell in the upper tray and four quarter charges of cordite in the compartment below. At gun house level, the shell tray was level with an intermediate tray, on to which the projectiles were manhandled, and then moved onto the loading tray, which was then swung round, and placed in position for ramming; this was normally done hydraulically but in emergency could be done by hand. Three rounds per minute per gun could be achieved. SWIFTSURE's rate of fire was just over two rounds a minute while contemporary 12 in mountings could manage one round a minute.

White's doubts about the long 7.5 in guns were fully justified, as in sea going conditions their muzzles were only 10 ft above water, so that they readily dipped into the sea when trained abeam.

Armour
This was superior to any contemporary armoured cruiser, and compared favourably with the CANOPUS and DUNCAN classes. The side armour above the main belt was 7 in thick to the upper deck, instead of ending at main deck level as in the RN designs, because the 7.5 in, main deck guns were not in casemates. The citadel so formed had 6 in bulkheads fore and aft running into the barbettes with a 1 in screen down the centreline and between each gun. Behind the 6 in bulkheads the barbettes were reduced to 3 in and then 2 in, which would have made them very vulnerable to deck hits in wake of the turrets.

Speed
Considerable doubts were expressed that SWIFTSURE's speed of over 20.02 knots on contractors trials could be maintained under Admiralty conditions, but in fact this proved to be the case.

Career
Served in the Home and Channel Fleet from 1904-08 (rammed by TRIUMPH 3 June 1905). Mediterranean from 1909-12 and then flagship in the East Indies in 1913. During World War One she saw service in the Red Sea and Suez Canal. In March 1915 she took part in the Dardanelles action, returning to the UK after the evacuation. Atlantic Patrol 1916-17. Reserve and accommodation ship at Chatham. In the autumn of 1918 she was dismantled to be used as a blockship in the second attempt to close Ostend but the Armistice came before the operation was mounted. Post-war used as a target ship until sold for scrap to Stanlee, Dover, 18 June 1920.

INVINCIBLE
Great Britain

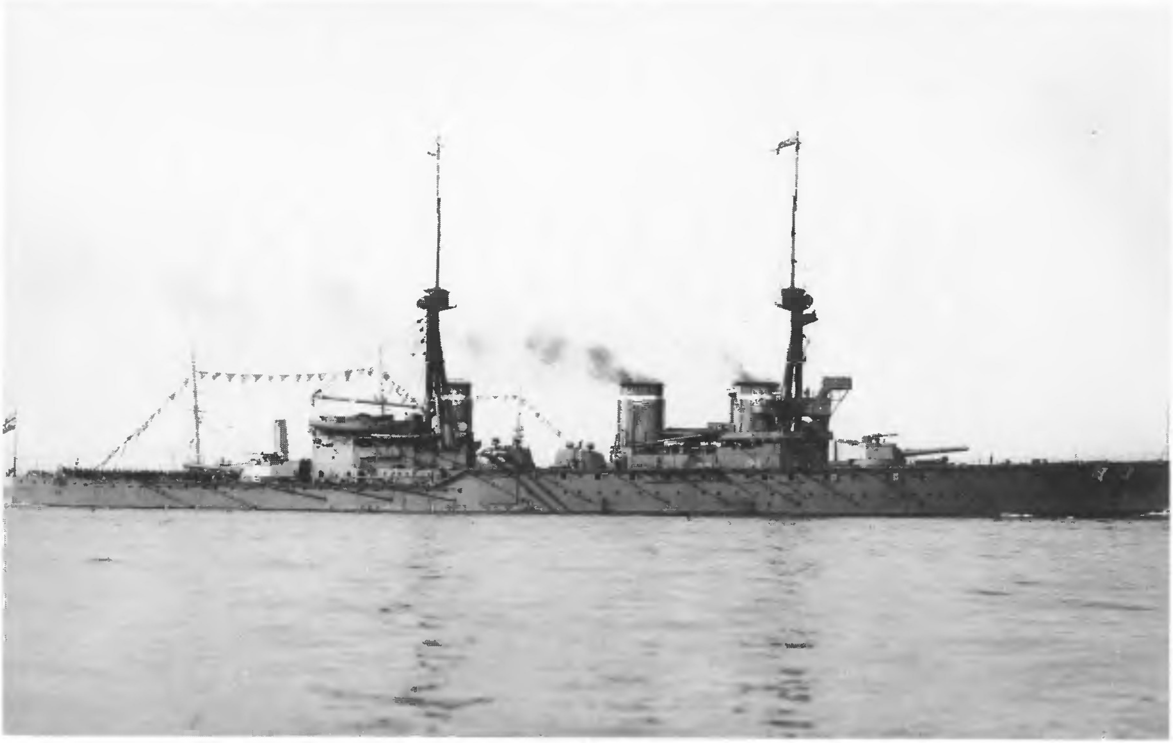
Yard & No	Laid down	Launched	Final trials	Designer
Elswick 785	1 Apr 1906	13 Apr 1907	15 Mar 1909	DNC

Displacement	17,482 tons
Dimensions	530 (567 oa) x 78 ft 5 in x 26 [161.5 (172.8 oa) x 23.9 x 7.9]
Armament	8 x 12 in 45 cal, 16 x 4 in 40 cal QF. 5 x 18 in TT, 4 broadside, 1 stern, all submerged.
Armour	Krupp. Belt between main and lower deck, 6 in, forward 4 in. Bulkheads aft 7 in - 6 in. Barbettes 7 in. CT 10 in forward. 6 in aft Decks: lower aft 2½ in, amidships 1½ in, slopes 2 in, forward 1½ in; main in way of 12 in barbettes 2in, forecastle ¾ in. 2½ in magazine protection.
Machinery	4 shaft Parsons turbines by Humphrys Tennant. 31 Yarrow wt boilers. Designed SHP 41,000 = 25 knots. Trials SHP 46,500 = 26.64 knots.
Fuel	2928 tons coal. 748 tons oil.

General
INVINCIBLE was the name ship of the first class of three ships of the battle cruiser type. A number of outlines were prepared by the Committee of Designs which had been set up by the First Sea Lord, Sir John Fisher, in December 1904. The committee was given a brief for an armoured cruiser of 25 knots and armed with 12 in guns. The committee recommended Design E with twin turrets fore and aft and two mounted close together en echelon amidships, so that in theory one could fire on the opposite side if the other was disabled. Turbine machinery was installed and 4 in guns substituted for the inadequate 12 pdrs of DREADNOUGHT's anti-destroyer armament.

Progress at Elswick was uneventful apart from slight delays due to problems with the installation and late delivery of the electrically worked gun mountings. Curiously she was never referred to by name in the report book until after she had been taken over.

Career
On the outbreak of war she became flagship of the 2nd BCS. Battle of Heligoland Bight 28 August 1914. Battle of the Falkland Islands (flag of Vice Admiral Sturdee) 8 December 1914, where she took part in the sinking of SCHARNHORST and GNEISENAU. At the Battle of Jutland, 31 May 1916, the roof of Q turret was struck by an 11 in shell fired by LÜTZOW. The flash went down into the magazines, which exploded, breaking INVINCIBLE in half. Her ends floated separately for a short while but only six of her crew were saved.



INVINCIBLE on completion in 1909. Photo : IWM Q21390

The South American Dreadnought Race

Until 1890 Brazil had the largest and most modern fleet of all the South American powers, but over the next 10 years Argentina and Chile had quite outstripped her. In 1905, largely, it would seem, for reasons of prestige, the Brazilian Congress provided money for an ambitious naval programme, including three 13,000 ton battleships, three 9,700 ton cruisers, six 400 ton destroyers, six 130 ton torpedo boats, six 50 ton torpedo boats and with provision also made for submarines. A year later however, with the completion of HMS DREADNOUGHT, the programme was modified to include three dreadnoughts, including 791 and 792, later MINAS GERAES and RIO DE JANEIRO, together with the two scout cruisers BAHIA and RIO GRANDE DO SUL. Argentina responded by ordering battleships from the USA, both with a main armament of 12 in guns; Chile, not to be outdone, then ordered two 14 in gun dreadnoughts, both from Armstrongs, ALMIRANTE LATORRE and ALMIRANTE COCHRANE.

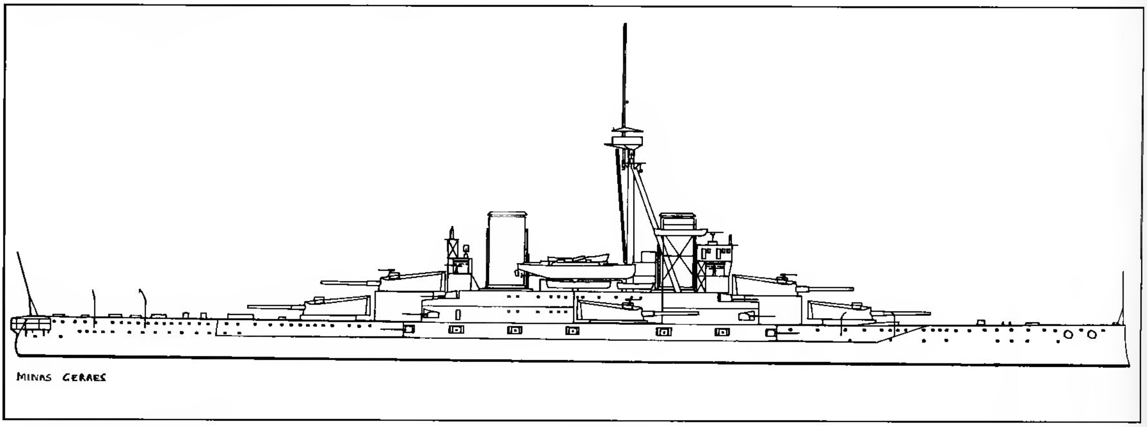
Brazil, realising that the RIO DE JANEIRO would be outgunned, sold her to Turkey and sought new designs resulting in the order for the 15 in gunned RIACHUELO. World War One put an end to this futile and expensive competition with RIACHUELO never being laid down, and Chile losing COCHRANE permanently. The depression immediately after the war, and the realisation that the expense of keeping a super-dreadnought in commission far exceeded its initial cost, meant that none of the South American powers had more battleships built for them.

MINAS GERAES

Brazil

Yard & No	Laid down	Launched	Final trials	Designer
Elswick 791	Initially Nov 1906 Finally 17 Apr 1907	10 Sep 1908	24 Sep 1909 Delivered 5 Jan 1910	J R Perrett

Displacement	19,280 tons normal.
Dimensions	500 (543 oa) x 83 x 25 [152.4 (165.5 oa) x 25.3 x 7.6] Freeboard 25 ft forward, amidships and aft.
Armament	12 x 12 in 45 cal BL, 22 x 4.7 in 50 cal QF, 8 x 3 pdr QF, 4 mg.
Armour	Krupp. Belt 9 in - 6 in - 4 in. Upper belt 9 in. Bulkheads to upper belt 9 in. Barbettes 12 in, hoods 12 in - 8 in (3 in - 2 in roofs). CT 12 in forward, 9 in aft. Decks: upper citadel 1½ in, main 2 in, middle 1 in, lower 1 in. Torpedo bulkheads to magazines and boiler rooms 1½ in.
Machinery	2 sets VTE by Vickers. 18 Babcock and Wilcox wt boilers. Designed IHP 24,000 = 21 knots. Full power trials IHP 27,212 = 21.43 knots.
Fuel	Coal. 800 tons normal, 2305 tons maximum.
Complement	900.



MINAS GERAES 1910

General

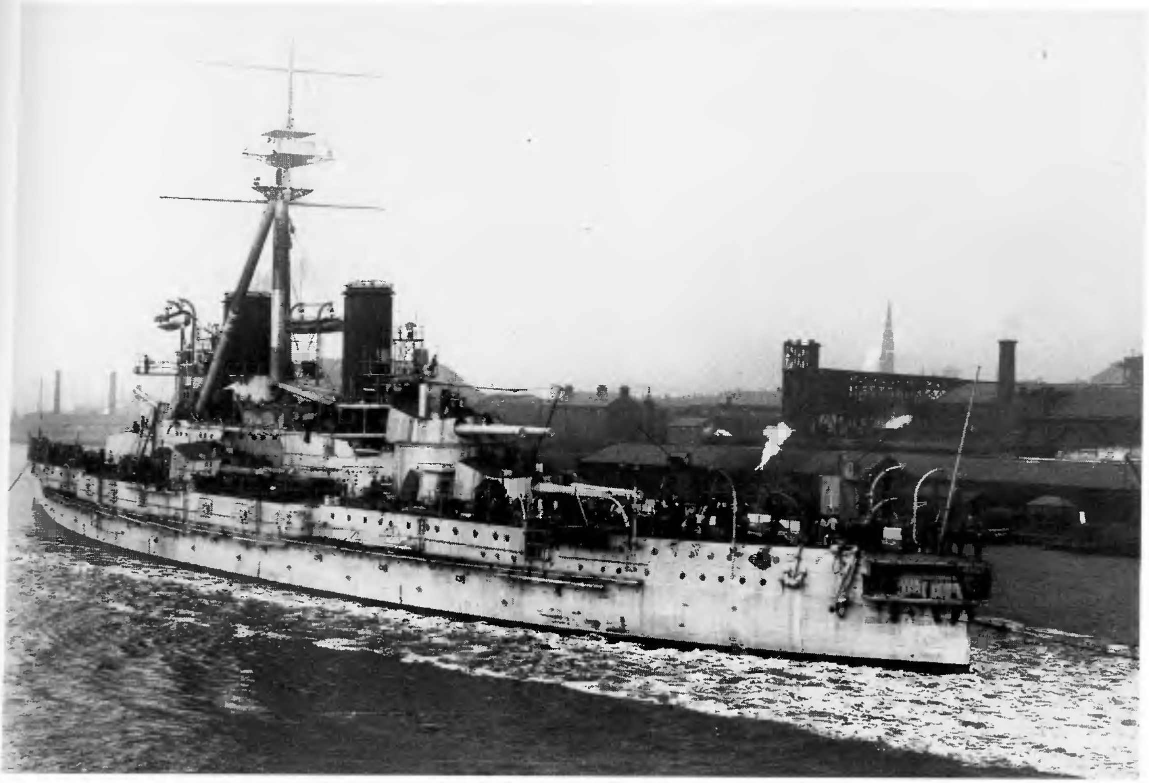
The design adopted, identical for both the MINAS GERAES and the Vickers built SAO PAULO, was an improved DREADNOUGHT, with two superfiring turrets fore and aft, and one on each beam. They were the first ships built in Britain with the superfiring arrangement, and although designed after the USS MICHIGAN class they entered service at almost the same time. They were the first Dreadnoughts to mount a 10 gun broadside, and with their powerful anti-torpedo armament of 22 x 4.7 in guns were the most heavily armed ships in the world when they were completed. Table 5/1 compares them with DREADNOUGHT, MICHIGAN and the first German dreadnought, SMS NASSAU.

TABLE 5/1

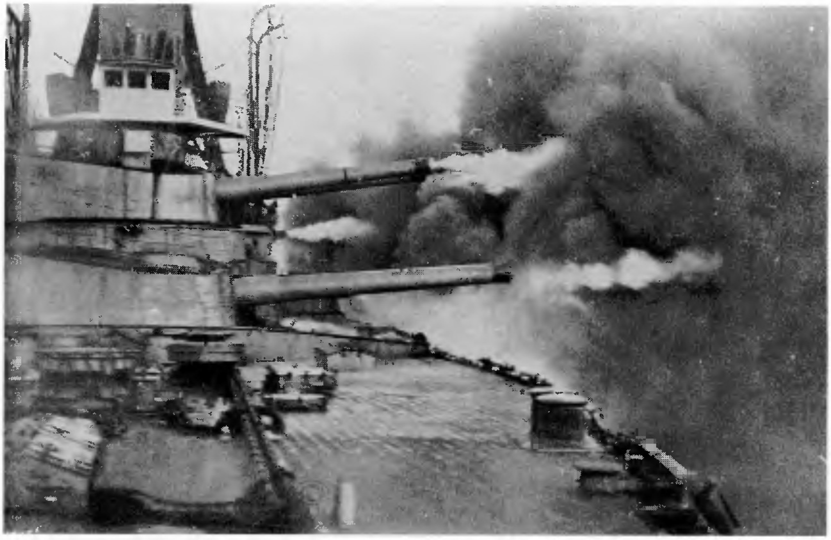
COMPARISON OF EARLY DREADNOUGHTS

	MINAS GERAES	**DREADNOUGHT**	**MICHIGAN**	**NASSAU**
Date laid down	Mar 1907	Dec 1905	Dec 1906	Jul 1906
Completed	Sep 1909	Oct 1906	Aug 1909	Oct 1909
Displacement (tons)	19,280	17,850	16,000	18,570
Length pp (ft)	500	490	450 (wl)	451.7
Beam	83	82	80.4	88.1
Armament	12 x 12 in 22 x 4.7 in	10 x 12 in 28 x 12 pdr	8 x 12 in 22 x 3 in	12 x 11 in 12 x 5.9 in 16 x 24 pdr
Broadside	10 x 12 in	8 x 12 in	8 x 12 in	8 x 11 in
Armour: Belt	9-6-4 in	11-7-6-4 in	12-10-8 in	12-3.2 in
Side above belt	9 in	8 in	10 in	6.3 in
Barbettes	12 in	11 in	10 in	11 in
Machinery	VTE	Turbines	VTE	VTE
Speed (knots)	21	21	18.5	19.5
Coal, normal (tons)	800	900	900	950
maximum	2305 +364 oil	2900 +1120 oil	2380	2700 +200 oil

Source : Conway 2.



MINAS GERAES under tow in the Tyne, summer 1909 Photo : UNT



MINAS GERAES was marginally the heaviest and the longest of the four. She fired a broadside 2 x 12 in heavier than any of the others, but had a thinner belt. Despite her reciprocating engines, she was as fast as DREADNOUGHT and more than a knot and a half faster than the other two; her fuel stowage compared favourably with the MICHIGAN, though it was substantially less than either DREADNOUGHT or NASSAU. Her freeboard forward was 10 feet less than DREADNOUGHTs.

MINAS GERAES firing a 10-gun broadside during trials Photo : Engineering 1/1910

Both MINAS GERAES and SAO PAULO were refitted in the United States in 1919-20, and emerged with US style wind baffles to their enlarged bridges and director tops as the main visible sign of the work. In 1934 - 38, MINAES GERAES was again refitted, oil burning Thornycroft boilers being installed; their uptakes led to a single funnel placed behind the tripod foremast. Improved fire controls were fitted.

Career

MINAS GERAES arrived in Rio in April 1910; in November along with other ships the crew mutinied because of harsh discipline, killing the captain and a number of other officers. In the First World War she formed part of the squadron patrolling the Brazilian coastal zone. In 1924 when the SAO PAULO mutinied MINAS GERAES remained loyal, but took little action apart from firing one 6 pdr shot. She took little or no active part in the Second World War, was sold in 1953, and scrapped in Italy in the following year.

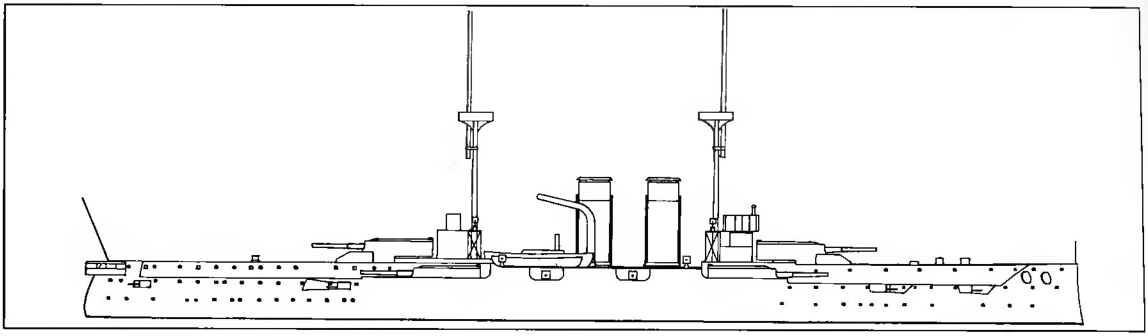
AGINCOURT

ex SULTAN OSMAN 1 ex RIO de JANEIRO

Brazil, Turkey then Great Britain

Design History

The design history of RIO DE JANEIRO is tortuous and complicated to say the least; the fullest account is in David Topliss' article in Warship International 3/1988 (pp 240-289). What follows below is a condensation and simplification of Topliss' article: table 5/2 lists only eight of the sketch designs but these totalled at least seventeen.



Design 439a, with 12 x 10 in in twin turrets disposed as in the German NASSAUs, but with the wing turrets a deck lower, which would have been very wet in any sea.

After a 10 in design (439) had been dropped, design 494a was produced, and MINAS GERAES and SAO PAULO built to it. The design of the third ship was radically recast because of the advent of the 13.5 in gunned superdreadnoughts, and designs 643, 644 and 645 were produced, but only 643 and 645 were submitted. The next design, 653, was developed from 645 in May 1910, but further modified after discussion with the Brazilians; but by the end of the year after agreement seemed to have been reached they again changed their minds, asking for a reversion to an all 12 in design, perhaps under the influence of Kaiser Wilhelm II whose own existing and projected battleships at that time mounted 12 in guns only. In response, 682 and 683 were produced, their mountings being all on the centre line with design 683 having 50 calibre 12 in guns. The next four designs 684, 684a, 685 and 685a were for 16 in gunned ships with the variants having thicker belts and barbettes. The next design, 686, had features both of a superdreadnought with 16 in guns, and of a predreadnought with an intermediate armament of 9.4 in guns. This was entirely a Brazilian concept suggested by Admiral Bacellar. The next pair 687 and 688 were similar to 682, but with a forecastle deck and triple expansion engines, while 689 had twelve 12 in and 690 had fourteen 12 in guns in seven turrets; this formed the basis of the final design 690a, which substituted 6 in guns as the secondary armament instead of the 4.7 in.

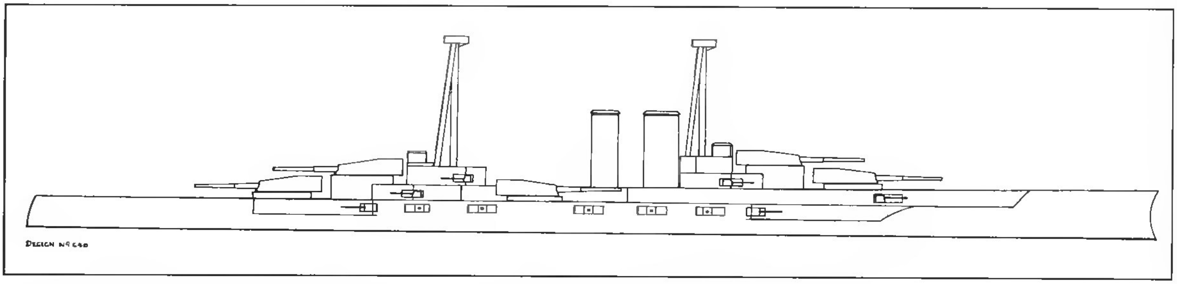
TABLE 5/2

PRELIMINARY DESIGNS FOR BRAZILIAN DREADNOUGHTS

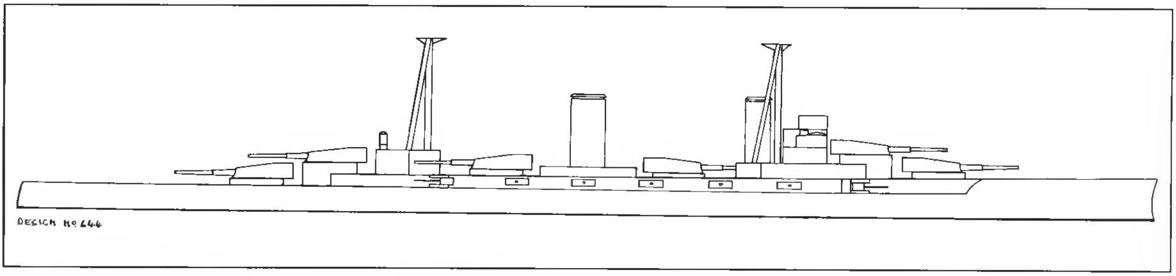
MAY 1910 - JANUARY 1911

Design No	643	644	645	653	682	684	685	686
Length (pp)	600	600	620	650	500	600	650	630
Beam	90	90	92	92	84	90	92	92
Displacement	28,000	27,000	30,000	31,000	19,350	27,750	31,230	30,500
Armament	10x14/45	12x12/50	12x14/45	12/14/45	10x12/45	8x16/45	10x16/45	8x16/45 6x9.4/51.7
	14x6/50	14x6/50	14/6/50	14x6 14x4	22x4.7	14x6	14x6	14x6
Machinery	Turbines	Turbines	Turbines	Turbines	VTE	Turbines	Turbines	Turbines
SHP	-	-	-	42,000	34,000	38,000	40,000	45,000
Boilers		Water-tube in all						
Speed	22 kts	22 kts	22 kts	22 kts	22 kts	23 kts	23 kts	23 kts
Fuel (coal in all)	2000/ 3000	2000/ 3000	2000/ 3000	2000/ 3000 Oil 600	800/ 2500	1500/ 3000	1500/ 3000	1500/ 3000
Armour								
Main Belt	12 in	12 in	12 in	12 in	9 in	10 in	10 in	10 in
Middle belt	8 in	8 in	8 in	9 in	8 in	8 in	8 in	8 in
Upper belt	6 in	6 in	6 in	6 in	6 in	6 in	6 in	6 in
Barbettes	14-10 in	14-10 in	14-10 in	12 in	9 in	10 in	10 in	10 in
Main deck	1 in	1 in	1 in	1 in	1-1½ in	1-1½ in	1-1½ in	1-1½ in
Middle deck	1 in	1 in	1 in	1 in	1 in	1 in	1 in	1 in
Lower deck	1 in	1 in	1 in	1 in	1 in	1 in	1 in	1 in

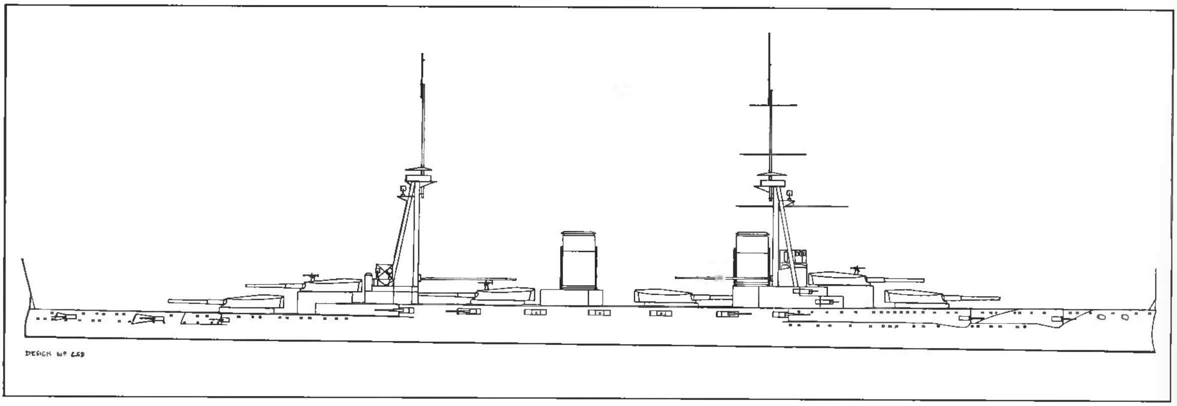
Source : Topliss



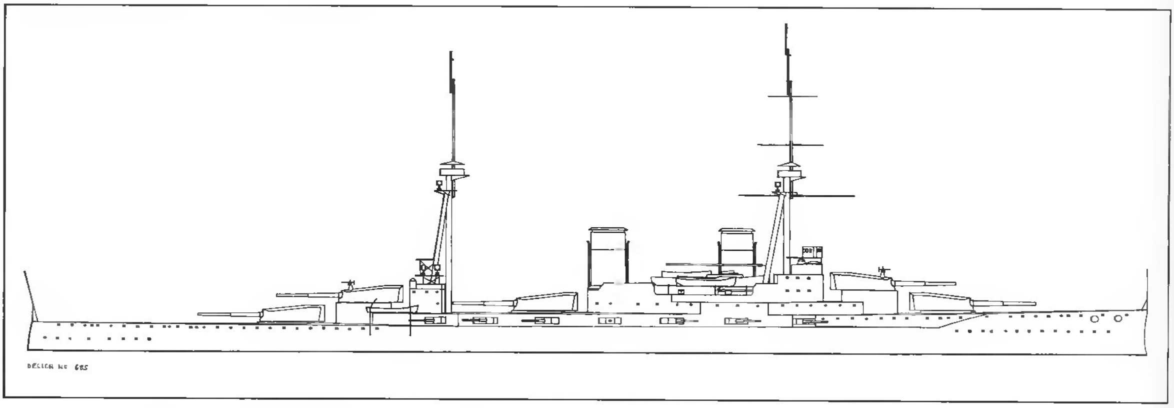
640, an early design which was little more than MINAS GERAES with a forecastle



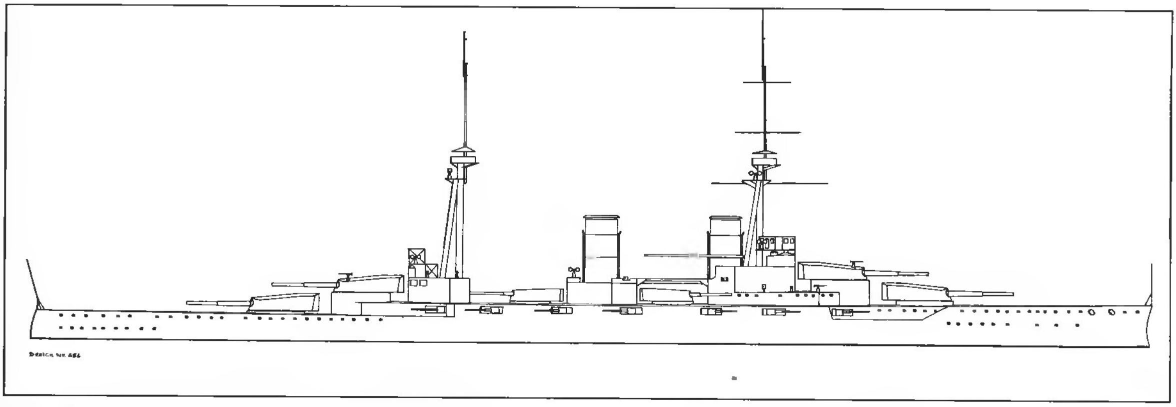
644, with the wing turrets en echelon and a 6 in secondary battery



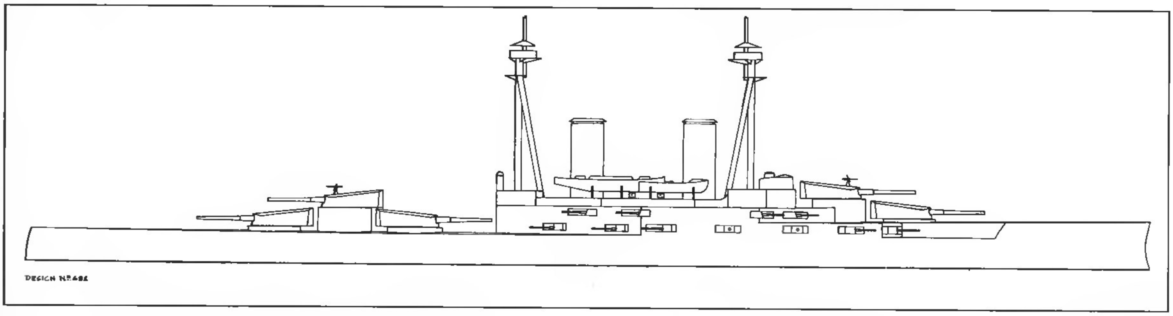
653, one of the first 14 in gun designs, also with the midships turrets en echelon



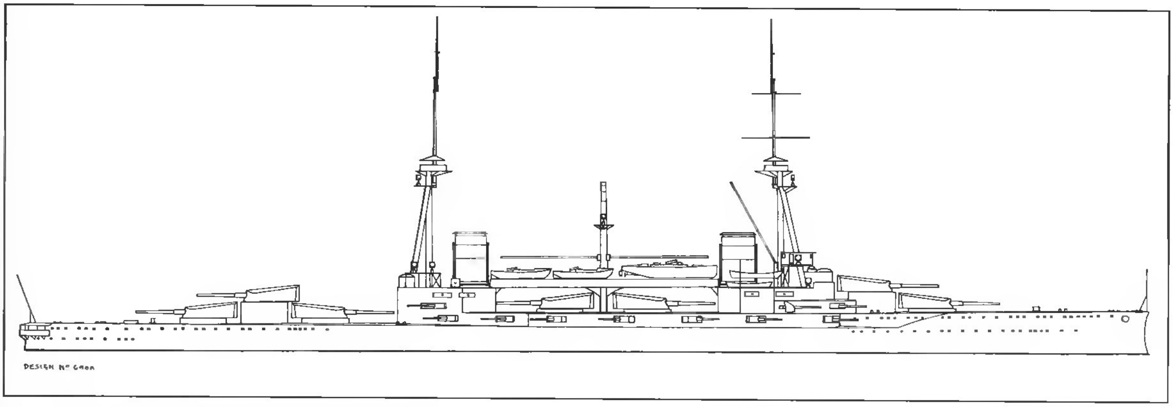
685, with 10 x 16 in in twin turrets, all on the centre line



686, the Bacellar monster, with four twin 16 in turrets in the conventional A,B,X and Y positions, but with Q taken up by no less than three twin 9.4 in turrets, two winged out and one on the centre line.



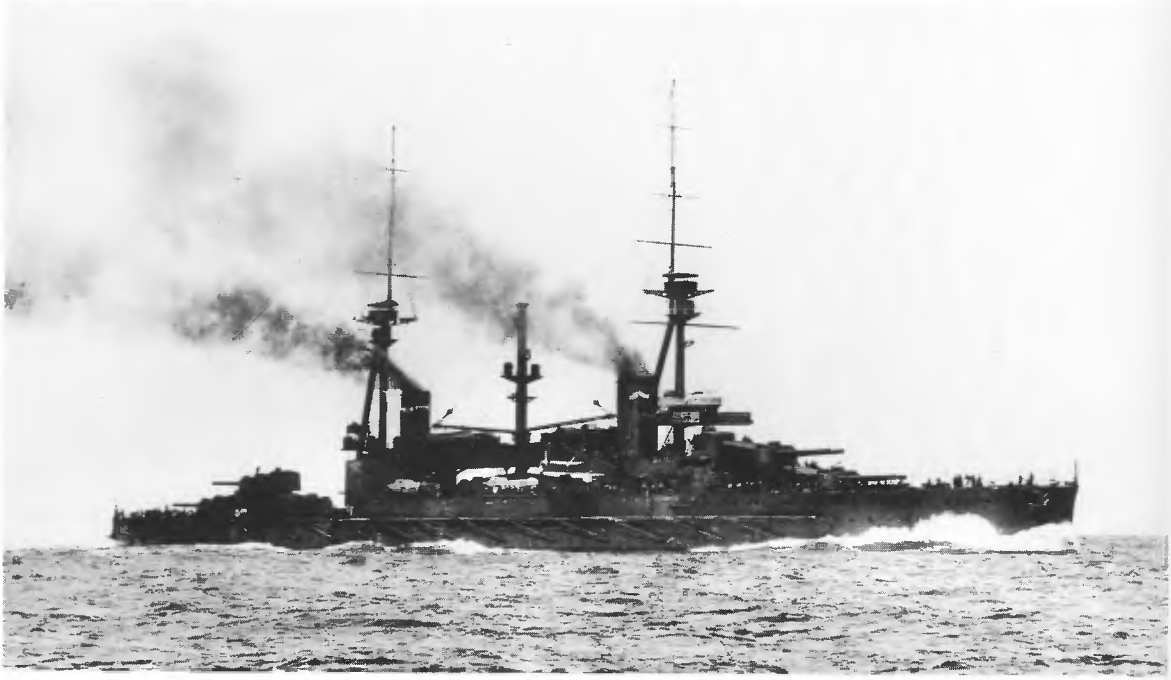
688, the first of the sequence of designs which, by an increase of a turret at a time, led to 690 and RIO DE JANEIRO.



690a, the design finally accepted by Brazil which became RIO DE JANEIRO.

But this was not the end of the story; by 1912 the Brazilian Government had repented of their decision partly because of a financial crisis, while at the same time the Chileans were laying down 14 in gunned ships. By September 1913 Brazil had instructed their agents, Messrs Rothschilds, to sell their ship; the Russians, Italians, French, Greeks and Turks all showed interest. Eventually RIO was transferred to the Turkish Government at a cost of £1,200,000 but with the Turks to pay for her completion, so that the final price would have been in the order of £3,000,000. The money was raised by public subscription. She was renamed SULTAN OSMAN I and was practically complete by the outbreak of World War One, running trials and waiting only for one of her 12 in and two of her 6 in guns. On 2 August 1914, the day before she was to be taken over by her Turkish crew an armed guard was placed on board and she was taken over by the British Admiralty and renamed AGINCOURT.

As designed the RIO had flying bridges over P and Q turrets but these were removed by the Royal Navy, with a reduced number of ships boats being relocated on cradles on the forecastle deck. Her after tripod mast was reduced to a pole in 1916 and removed altogether in 1917.

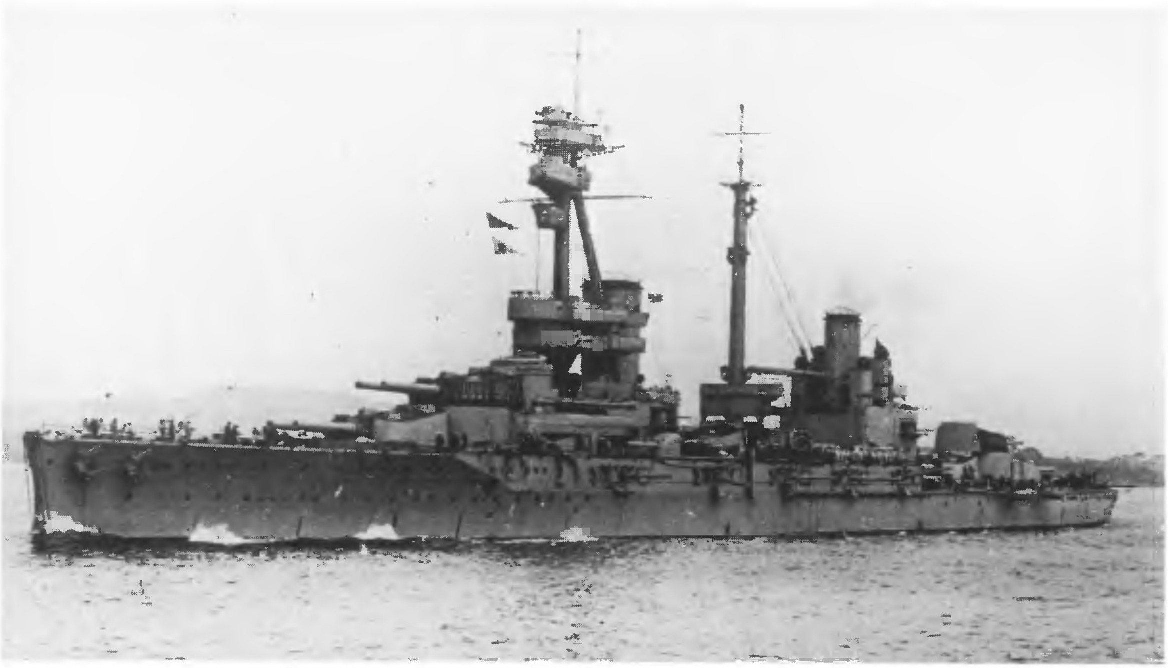


SULTAN OSMAN I running trials in the last days of peace. Note that W turret is without its guns

Photo : Vickers Archive CUL

Yard & No	Laid down	Launched	Completed	Designer
Elswick 792	Initially Nov 1906 Re-laid down 10 Jan 1910 Final 14 Sep 1911	22 Jan 1913	25 Aug 1914	J R Perrett

Displacement	27,528 tons normal. Trials 30,860 tons.
Dimensions	632 (688 oa) x 89 x 27 (29 deep) [192.6 (203.6 oa) x 27.1 x 8.2 (8.8 deep)]
Armament	14 x 12 in 45 cal BL, 20 x 6 in 50 cal QF, 10 x 3 in QF, 4 x 3 pdr QF. 3 x 21 in TT. 2 broadside, 1 stern submerged.
Armour	Krupp. Belt 9 in - 6 in - 4 in. Bulkheads 6 in - 3 in. Barbettes 9 in - 3 in - 2in. Barbette hoods 12 in front,10 in rear, 8 in sides. Battery 6 in. Fore CT 12 in, aft CT 9 in. Decks 1½ in slopes - 1 in flat, lower 1 in; Bulkheads to magazines 1½ in - 1 in.
Machinery	4 shaft Parsons direct acting turbines by Vickers. Boilers 22 Babcock & Wilcox. Designed SHP 32,000 = 22 knots. Trials SHP 24,000 = 20.5 kts for eight hours. Full power SHP 40,126 = 22.42 kts
Fuel	Coal. 1500 tons normal, 3000 tons maximum. Oil 600 tons.
Complement	1100.



AGINCOURT in 1918, with flying bridges and mainmast removed, and with short topmast on the central derrick post. Photo : WSPL

Career

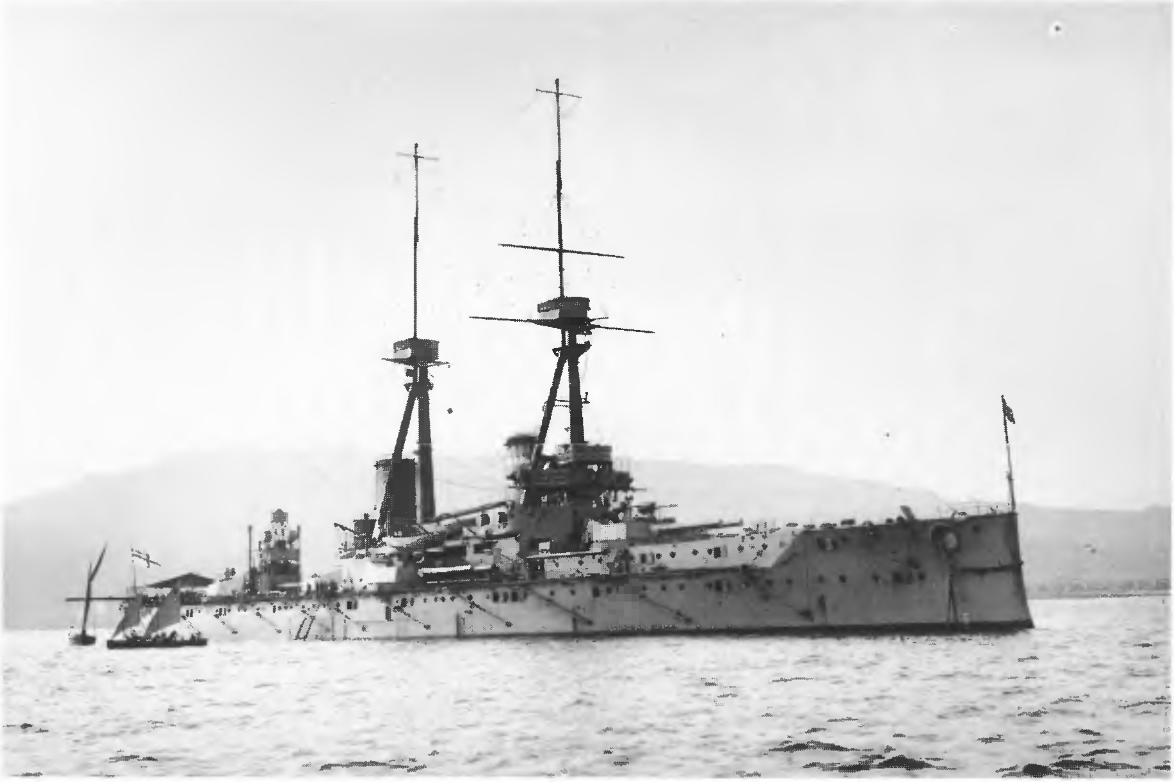
She joined the Fourth Battle Squadron of the Grand Fleet on 7th September. At Jutland she was in the First Battle Squadron's sixth division firing 144 rounds of 12 in, and 111 of 6 in; she received no hits. Later she was transferred to the Second Battle Squadron, and after the war was on the disposal list from 1919 to 1921, but recommissioned at Rosyth in 1921 for experimental purposes. Stripped for conversion to a Mobile Naval Base, involving the removal of all turrets except 1 and 2 and the provision of extra oil fuel and ammunition stowage. Work stopped late in 1921. Sold for scrapping at Rosyth, 19 December 1922 to Rosyth Shipbreaking Co. under the terms of the Washington Treaty.

SUPERB

Great Britain

Yard & No	Laid down	Launched	Handed Over	Designer
Elswick 800	4 Feb 1907	7 Nov 1907	24 Feb 1909	DNC

Displacement	8,663 tons. (18,713 tons on trial).
Dimensions	490 (526 oa) x 82 ft 5¼ in x 27 [149.4 (160.3 oa) x 25.1 x 8.2]
Armament	10 x 12 in 45 cal, 16 x 4 in 50 cal QF. 3 x 18 in TT, 2 beam, 1 stern submerged.
Armour	Krupp. Belt: lower strake 10 in - 9 in - 7 in - 6 in forward; upper strake to main deck 8 in - 7 in - 6 in forward. Side armour aft 5 in. Bulkheads lower to main deck 9 in. Barbettes 9 in above main deck, 5 in below. CT 11 in - 8 in. Observer tower 8 in. Decks 4 in - ½ in.
Machinery	4 shaft Parsons turbines by Wallsend Slipway and Engineering Co. 18 Babcock & Wilcox boilers. Designed SHP 23,000 = 21 knots. Trials SHP 25,400 = 21.6 knots.
Fuel	Coal. 900 tons normal, 2648 tons maximum. Oil 845.7 tons.
Complement	690



SUPERB at Portland, between 1910 and 1912 Photo : NMM N20132

General

One of three BELLEROPHON class, improved DREADNOUGHTs with 4 in QF replacing 12 pdrs and with two tripod masts, one ahead of each funnel.

Career

1st BS Home Fleet 1909. Grand Fleet August 1914. Flagship 4th BS 1915 and took part at the Battle of Jutland. Postwar, turret drillship. Struck off the Navy List in 1920 and used as target. Sold to Stanlee, Dover 12 December 1922 for breaking up.

MONARCH

Great Britain

Yard & No	Laid down	Launched	Left Tyne	Designer
Elswick 828	1 Apr 1910	30 Mar 1911	6 Nov 1911	DNC

Displacement	22,645 tons on trial.
Dimensions	545 (581 oa) x 88 ft 6 in x 27 ft 6 in [166.1 (177.1 oa) x 27 x 8.4]
Armament	10 x 13.5 in 45 cal, 16 x 4 in 50 cal BL, 1 x 12 pdr 8 cwt, 10 x 6 pdr QF, 4 x 3 pdr QF, 3 x 21 in TT, 2 broadside, 1 stern submerged.
Armour	Krupp. Sides 12 in - 2 in, middle strake 8 in - 9 in. Bulkheads 4 in - 2 in. Screen bulkheads 10 in - 8 in - 6 in. Barbettes 10 in - 9 in - 7 in - 6 in - 3 in. CT 11 in. Director tower 3 in. Decks: middle 1 in amidships; lower 1 in amidships, 2½ in forward, 3 in and 1 in aft; upper deck over citadel 1½ in; main deck 1½ in between screens.
Machinery	4 shaft Parsons turbines by R & W Hawthorn Leslie. 18 Babcock & Wilcox boilers. Designed SHP 27,000 = 21 knots. Trials SHP 27,651 = 21.83 knots.
Fuel	Coal. 3234 tons maximum.
Complement	836 as Flagship, 759 otherwise.

General

MONARCH was one of the four ORION class of the 1909 programme, often referred to as super-dreadnoughts as they mounted 13.5 in guns in five centre line turrets and were much larger than preceding classes.

Career

Home Fleet 1912-14. BS Grand Fleet until end of war. Stricken under the terms of the Washington Treaty and used as a target in 1925 and sunk 20 January 1925 off the Scilly Isles.

MONARCH being brought down the Tyne through the Newcastle bridges, 1911, with mast lowered
Photo : The Shipbuilder

A note on the Armstrong's design for the Turkish battleship RESHAD-I-HAMISS

Contemporary reference books (Brassey 1910, 1911 and 1912) and historians of battleship design (Parkes; Burt, British Battleships of World War One) are unanimous in asserting that Turkey ordered two battleships in 1911, one, RESHAD V (later RESHADIEH) to be built at Barrow by Vickers, the other, RESHAD-I-HAMISS, to be built at Elswick by Armstrongs. Brassey and Burt agree that both were laid down but, because of the Balkan Wars 1912-13, when Turkey lost most of her European territories, only RESHAD V was proceeded with. Again, Parkes and Burt ascribe the design either solely to Sir George Thurston (at that time called T G Owens) or a combination of design work by Vickers, John Brown and Armstrongs.

Armstrongs records give a quite different story. Portfolio No 3 lists outline specification for eight designs, together with drawings of one of them, 698A, dating from July 1910 to 7 September 1911; this last was given the number 698C.

The Elswick Yard Report Book in March 1910 records that, in the two previous months, Armstrongs had been engaged in the preparation of designs of various war vessels for Turkey. In May of the following year Josiah Perrett reported that the designs of battleships for the Imperial Ottoman Navy were still being considered by the Turkish commission, while in July it was reported that the commission was examining the final construction contracts, specifications and designs for the battleships.

Finally, on 18 September 1911, Perrett recorded that a contract for one battleship had been concluded on 27 July, but that although the vessel would be built to Elswick design 698C it would be constructed at Barrow by Vickers. All these details are confirmed in the directors minute book.

There was, then, never any question of a Turkish battleship being ordered, let alone laid down by Armstrongs. One ship only was ordered and under a work sharing agreement between Armstrongs and Vickers (fiercely criticised by Lord Rendel), the former would be responsible for the armament, the specification for which is in the Cambridge University Library's Vickers Archive, and the latter for the hull. The records also make it clear that Perrett, and not Owens, was responsible for the basic design of RESHADIEH, which was taken over by the Admiralty in August 1914.

It is worthwhile looking at how the design evolved into its final form from the outline specification, dating from 1910 to 1911. What makes designs 700 and 698A interesting is that they carried their 6 in guns in twin gunhouses at upper deck level instead of main deck casemates. The plan for 698A shows that two pairs were mounted just aft of F (no2) turret and the other two pairs between Q and X turrets. There is a five month gap before the appearance of 698C in the records; this design is considerably larger than its predecessors and much better armoured.

TABLE 5/3
DESIGNS FOR TURKISH BATTLESHIPS

Design No	**655**	**656**	**657**	**699**	**700**	**698A**	**698C**
Date	18 Jul 10	22 Jul 10	22 Jul 10	25 Mar 11	7 Apr 11	10 Apr 11	7 Sep 11
Displacement	16,650	18,100	19,200	19,500	18,800	20,600	23,000
Length (ft)	450	465	500	500	470	510	525
Beam (ft)	81	82	83	84	85	84	91¼
Draught(ft)	26½	26½	27	27	27	27½	28 ½
Armament	8 x 12in 10 x 6in 10 x 4in 3 x 18in TT	8 x 13.5 in 10 x 6 in 10 x 4 in 3 x 21in TT	8 x 14 in 10 x 6 in 3 x 21in TT	10 x 12 in (2x3, 2x2) 8 x 6 in 10 x 3 in 3 x TT	8 x 13.5 in 16 x 6 in (in gunhouses) 2 x 3 in 3 x 21in TT	10 x 12 in (5 x 2) 8 x 6 in (in gunhouses) 12 x 3 in 3 x 21 in TT	10 x 13.5 in 16 x 6 in 6 x 6 pdr 2 x 3in landing 3 x 21in TT
Armour							
Belt	10 in - 4 in	as 655	as 655	9 in - 4 in	10 in - 4 in	as 700	12 in-6 in-4 in
Upper belt	6 in			6 in	6 in	except	9 in
Citadel	5 in					6 in gunhouses	6 in
Bulkheads	9 in, 5 in			5 in, 4 in	6 in	6 in	5 in - 4 in
Barbettes	9 in - 7 in			9 in - 7 in			10 in
CT	12 in			12 in	12 in		10 in
Decks	1½in-1¾in-3in			1½ in			1½ in - 3 in
					6 in gunhouses 5 in		
Machinery	Turbines wt boilers	as 655	as 655				Turbines Babcock x Wilcox boilers
Speed	20 kts						21 kts
Fuel (tons)	Coal 600/1800	Coal 1200/2000	Coal 1000/2200				Coal 900/2120 Oil 636

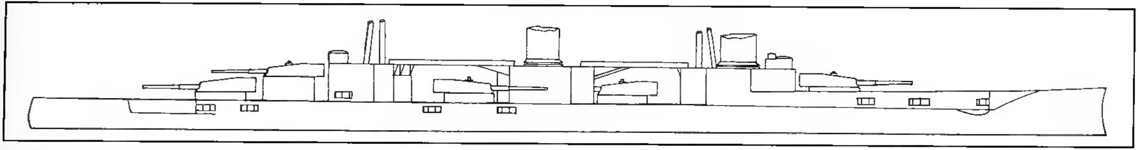
ALMIRANTE LATORRE
ex HMS CANADA, ex ALMIRANTE LATORRE
Chile later Britain later Chile

Design History

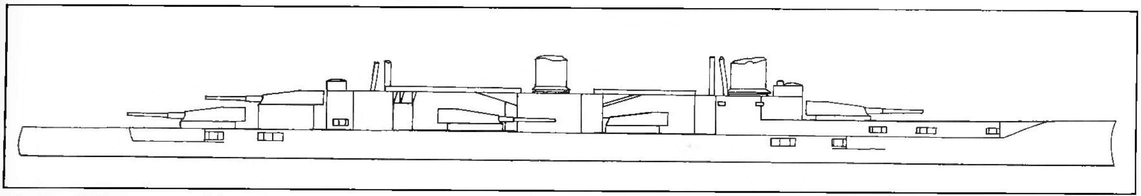
Armstrongs submitted their first of five designs at Chile's invitation (666 proposal A) on 4 April 1911. This had ten 12 in and twenty 4.7 in. The 12 in twin turrets were mounted 1 forward, 2 en echelon amidships, (port forward) and two superimposed turrets aft, the same arrangement as in the British NEPTUNE Class, but with a secondary armament of 4.7 in guns instead of 4 in. Speed was to be 23 knots; the main belt, 8 ft wide, was 9 in thick with a 7 in upper belt.

Four more designs were presented to Chile on the same date. (Table 5/4). Proposal D had ten 14 in guns arranged as in proposal A but with an increased secondary battery of eight 6 in, four in 6 in casemates, and two forward and two aft at main deck level together with twelve 4.7 in. Proposal H was 600 tons heavier, with five twin 14 in gun turrets, two super firing turrets forward, two astern similarly arranged, and a centre line turret amidships at forecastle deck level as in HMS ERIN. The secondary armament was to be fourteen 6 in behind 6 in armour at upper deck level. Speed and protection were essentially similar to Proposal A.

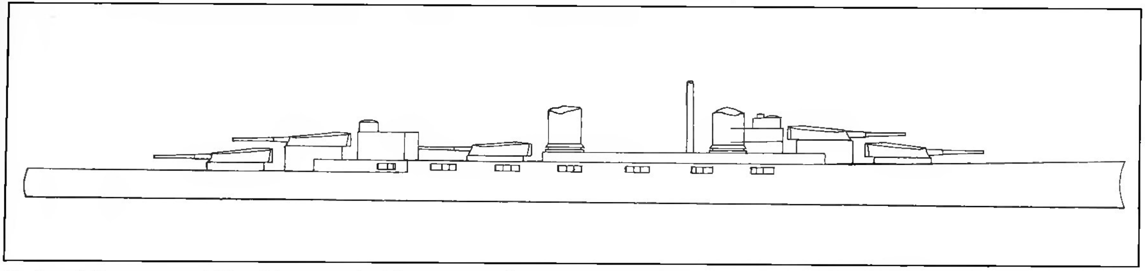
5 Chilean proposals (4 shown)



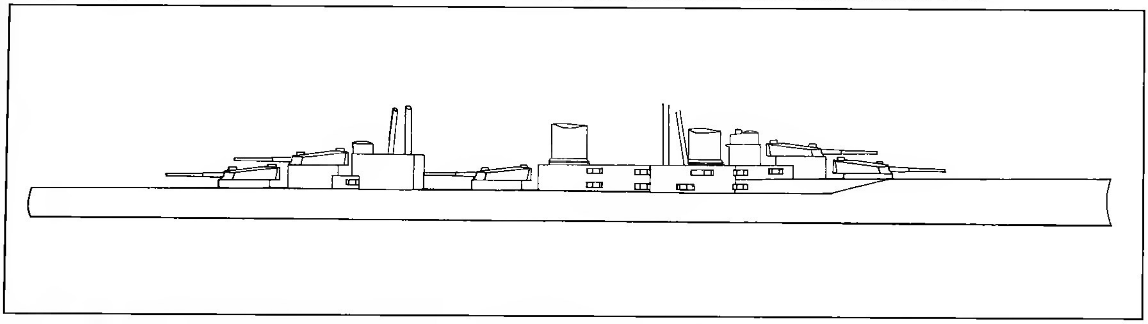
Design 666, proposal A, with 10 x 12 in guns



Design 669, proposal D, with 14 in main armament and mixed secondary armament



Design 670, proposal H, with extended forecastle deck and all centre line main armament of 14 in



Design 695, proposal E, 12 in main armament with Q turret on upper deck
Design 696, proposal F, was outwardly the same as 695, but with 14 in main armament. This was the accepted design, modified to have the foremast before the forefunnel and with 6 in secondary armament in place of the 4.7 in

Proposal E reverted to a 12 in armament as in H, with displacement dropping to 25,400 tons and a secondary armament reverting to twenty 4.7 in.

Proposal F displaced 27,400 tons with ten 14 in guns disposed as in H, except that the amidships turret was carried at upper deck level, with a secondary armament of twenty 4.7 in. This design was accepted by Chile in November 1911 the, first ship being named VALPARAISO, then briefly renamed LIBERTAD, and finally launched as ALMIRANTE LATORRE. A second ship was offered as an option and the ALMIRANTE COCHRANE was ordered in June 1912 with a final agreement being signed on 29 July 1912.

TABLE 5/4

PRELIMINARY DESIGNS FOR CHILEAN BATTLESHIPS ALMIRANTE LATORRE AND ALMIRANTE COCHRANE

Design No	**666**	**669**	**670**	**695**	**696**
Proposal letter	**A**	**D**	**H**	**E**	**F**
Date	4 Apr 1911	4 Apr 1911	4 Apr 1911	4 Apr 1911	4 Apr 1911
Displacement (tons)	24,700	27,000	27,600	25,400	27,400
Dimensions (ft)					
Length pp (oa)	610 (646)	625 (661)	625 (661)	616 (646)	625 (661)
Beam	89	91½	92	90	92
Draught	27	28	28	28	28
Armament	10 x 12 in 20 x 4.7 in	10 x 14 in 8 x 6 in 12 x 4.7 in	10 x 14 in 14 x 6 in in upper deck citadel	10 x 12 in 20 x 4.7 in	10 x 14 in 20 x 4.7 in
	4 x 12 pdr landing 4 x 6 pdr QF 2 x 37 mm pompom 4 mg 4 x 21 in TT (submerged)	smaller as 666	smaller as 666	smaller as 666	smaller as 666
Armour					
Belt	9 in-6 in-4 in	as 666	as 666	as 666	as 666
Middle belt	7 in	as 666	as 666	as 666	as 666
Bulkheads	4 in	as 666	as 666	4 in-3 in	as 695
Main deck casemates	1 in	as 666	Citadel 6 in	casemates 3 in	as 695
Upper deck casemates	3 in	as 666			
Barbettes	10 in-4 in	10in-8in-6in-4in	as 669	as 669	as 669
Decks					
Protective	4 in-1 in	as 666	as 666	as 666	as 666
Lower	2 in-1 in	2 in for'd	as 669	as 669	as 669
Main aft		1½ in		as 669	as 669
Forecastle over casemates		1 in	1½ in	1 in	1 in shelter deck
Shell Rooms & Mags		2 in	as 669	as 669	as 669
Bulkheads		2in-1½in-¾in	as 669	as 669	as 669

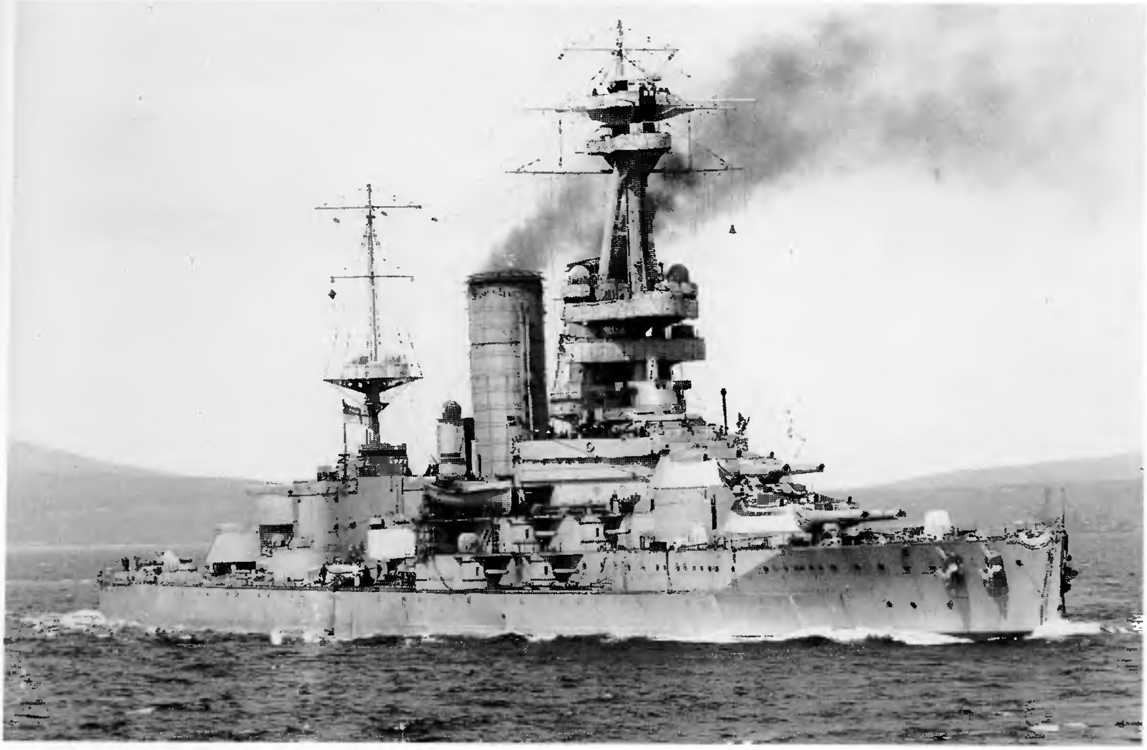
Machinery for all Turbines, watertube boilers. Speed 23 knots.
Fuel (tons) 1200/3600 coal, 500 oil

Source : Design Portfolio 3

ALMIRANTE LATORRE

Yard & No	Laid down	Launched	Final trials	Designer
Elswick 845	1 May 1912	27 Nov 1913	13 Sep 1915	J R Perrett

Displacement	28,000 tons
Dimensions	625 (661 oa) x 92 x 28 ft 6 in [190.5 (201.5 oa) x 28 x 8.7]
Armament	10 x 14 in 45 cal, 16 x 6 in 50 cal, 4 x 3 in 50 cal, 2 x 12 pdr 28 cal landing, 4 mg. 4 x 21 in TT submerged broadside.
Armour	mostly Armstrong improved. Belt 9 in-6 in-4 in. Middle belt 7 in for length of 9 in belt. Upper belt 4½ in amidships. Bulkheads 4 in aft, 3 in forward. Upper casemate & battery, forecastle casemates 6 in. Barbettes 10 in-6 in-4 in. Decks; shelter over battery 1 in. Upper over citadel 1 in. Protective amidships 1 in. Forecastle over battery 1 in. Protective aft 4 in. Lower forward 2 in. Bulkheads to magazines and shellrooms 2 in-1½ in. CT 10 in. At 28 ft 6 in draft belt extends from 2 ft 11½ in above water to 5 ft ½ in below.
Machinery	2 sets Brown-Curtis (HP) turbines by John Brown, Clydebank. 2 sets Parsons turbines (LP) by Parsons. Four shafts. 21 Yarrow large tube boilers. Designed SHP 37,000 for eight hours with no more than ½ in pressure in boiler rooms = 22.75 knots.
Fuel	Coal. 1200 tons normal, 4000 tons maximum. Oil 500 tons.



CANADA under way in Scottish waters about 1915 Photo : IWM SP1938

General

ALMIRANTE LATORRE was laid down in May 1912 but the Chileans then asked to have 6 in guns instead of 4.7 in as secondary armament; this change increased the draft by 6½ in, so that the thick belt was only 2 ft 11½ in above water line at normal displacement, and was submerged at deep level, while speed was reduced by ¼ knot. The 6 in guns were mounted behind 6 in armour, eight at upper deck level forward, four aft, and four at forecastle deck level forward.

By November 1912 although initial progress had been good, work was slowed up by difficulty in obtaining shell plating because of great activity in shipyards throughout Great Britain and was then further delayed by late delivery of armour.

Work on ALMIRANTE LATORRE and ALMIRANTE COCHRANE ceased in August 1914, but was resumed on ALMIRANTE LATORRE in the following month, both having been taken over by the Admiralty. A number of modifications were made including removal of the original bridge and charthouse, rearrangement of the mast platforms for fire control, substitution of a single pole carrying a searchlight top for the twin stumps on the after superstructure, lowering of the funnels, replacing the two derrick posts athwart the fore funnel by a single larger stump abaft it, additions to the conning tower, and rearrangement of the search lights etc. She was renamed CANADA.

Compared with her contemporary, IRON DUKE, ALMIRANTE LATORRE was two knots faster but had battle cruiser protection only.

In 1916 the two aftermost 6 in guns in the forward upper deck battery were removed as they had been badly affected by a blast when "Q" turret was firing on ahead bearings. Two 3 in AA guns were mounted on the after superstructure. She was returned to Chile in 1920 without any modifications from her wartime state. She received a major modernisation at Devonport from 1929 to 1931. She was converted to all oil fired boilers with new turbines, was given 4 x 4 in AA in place of the 2 old 3 in and had her fire control arrangement completely updated. A platform and a structure for a catapult were installed but no catapult was fitted, apparently on cost grounds. In mid March 1921 an Italian made air-impulse catapult was fitted but removed in a 1937 refit. Her AA armament was supplemented by 18 x 20 mm by the end of the Second World War.

After the war Vickers drew up plans for modernising her AA armament. One proposal featured six twin 4 in and five twin 40 mm mountings. Nothing came of these proposals.

Career

CANADA joined the Grand Fleet in October 1915, and was part of the 4th Battle Squadron at Jutland, sustaining no casualties. She had aeroplane launching platforms fitted to "B" and "X" turrets in 1918.

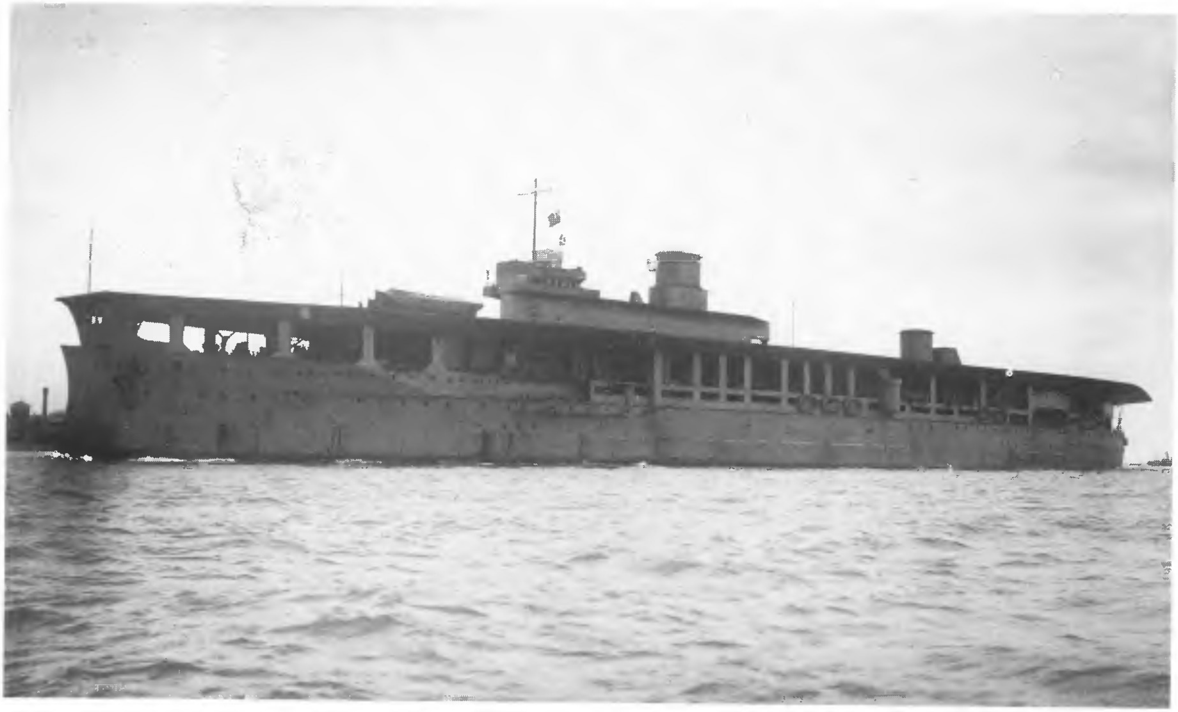
In 1920 she was refitted at Devonport and sold back to Chile for £1,000,000 which was less than half her construction cost, and reverted to her old name of ALMIRANTE LATORRE.

After her return to Chile following the 1929-31 refit in Devonport, LATORRE's crew took part in the naval mutiny caused by a sudden pay cut in September 1931. Along with other mutinous units, she was bombed by loyal aircraft, but suffered no damage. During the Second World War she was offered first to Great Britain and then to the United States, but neither power accepted her. She was refitted at Talcahuano in 1950, but in 1951 suffered an engine-room explosion after which she was never fully repaired. She remained inactive until she was decommissioned in October 1958 and was sold for scrapping in Japan in February of the following year.

EAGLE
ex ALMIRANTE COCHRANE
Chile then Great Britain

Yard & No	Laid down	Launched	Commissioned for trials	Designer
Elswick 858	24 Feb 1913	8 Jun 1918	13 Apr 1920	J R Perrett as battleship DNC as aircraft carrier

Displacement	22,600 tons standard. 26,680 tons deep load.
Dimensions	627 ft 1 in (667 ft 6 in oa) x 105 ft 2 in hull outside bulges, (flying deck 100 ft) x 21 ft 9 in (26 ft 6 in deep) [191.1 (203.45) x 32.06 hull (30.5 flying deck) x 6.63 (8.08 deep)]
Armament	6 x 6 in 50 cal, 2 x 3 in AA, 4 mg. Aircraft 22 (in 1942)
Armour	4½ in belt. 4 in bulkheads. 1½ in main deck and hanger deck. 1½ in bulges.
Machinery	4 shafts. 2 sets Brown Curtis HP turbines by John Brown Clydebank. 2 sets Parsons LP turbines. SHP 55,000 = 24 knots.
Fuel	Oil 3750 tons, coal 1750 tons.



EAGLE as commissioned for trials in 1920 with minimal bridge and only 1 funnel

Photo : NMM N4028

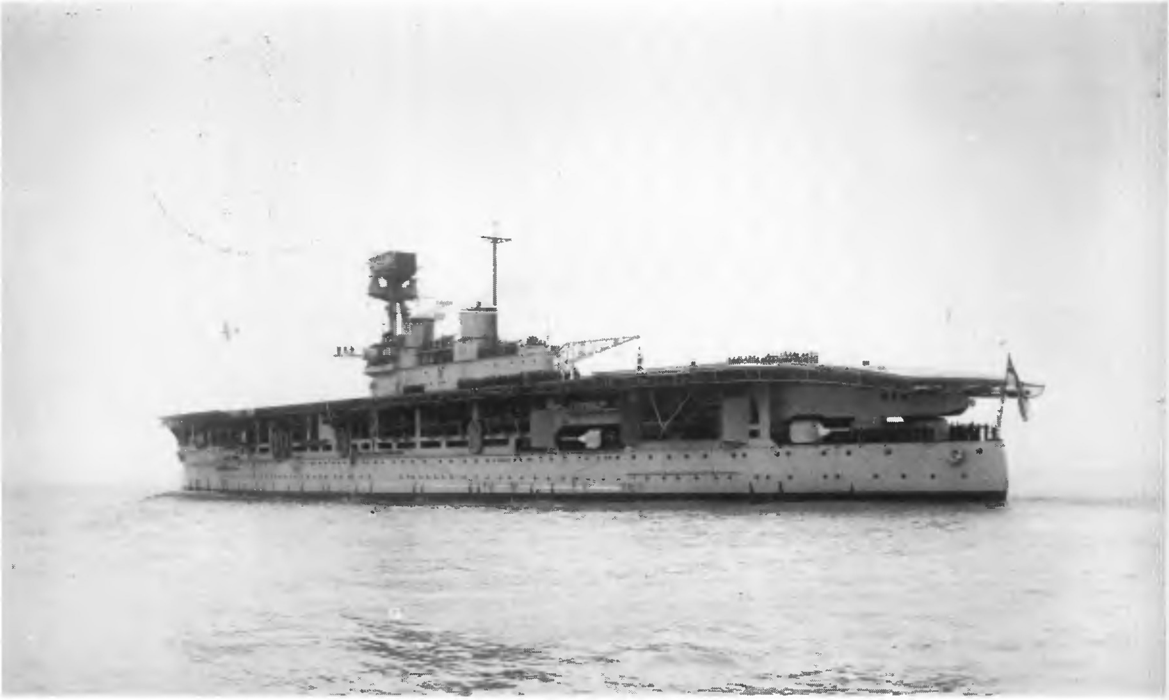
General

Her contract was signed on 29 July 1912, as outlined under ALMIRANTE LATORRE. By November 1912, though a large amount of material had been ordered no work had begun. After problems obtaining steel she was finally laid down in February 1913. All work on her ceased in August 1914, by which time her hull and machinery were nearly complete, with her boilers on board, but with little armour having been fitted. Britain, when taking over ALMIRANTE LATORRE in 1914, had promised Chile that both she and ALMIRANTE COCHRANE would be returned at the end of hostilities. However, the latter's guns and mountings were diverted to other ships being pressed to completion, so that she could not be completed as a battleship without inordinate extra expense. It was therefore decided in 1918 to purchase her outright for conversion to an aircraft carrier. The conversion was ordered on 25 Jan and she was renamed EAGLE in March.

Experiments were carried out on the ARGUS, the first flush-decked carrier, before the design of EAGLE was finalised with a single island to starboard. After the Armistice work proceeded slowly and stopped altogether 21 October 1919 and she left for Portsmouth Dockyard 20 April 1920. She was then commissioned for flying trials only partially complete, with her island in place but with only one funnel and no masts. After trials she was pressed to full completion at Portsmouth Dockyard with two funnels, a heavy tripod foremast and a pole main, and finally commissioned in 1923.

Career

Between the wars she saw service in most parts of the world. During World War Two she spent most of her time in the Mediterranean and as part of Force H operating from Gibraltar. She was torpedoed and sunk by U73 on 11 August 1942 while part of the escort of the vital Malta convoy in Operation Pedestal.



EAGLE as finally completed with two funnels, larger bridge and flying control position, and heavy tripod foremast with sided directors on the large top Photo : NMM N4032

MALAYA

Great Britain

Yard & No	Laid down	Launched	Completed	Designer
High Walker 678	21 Oct 1913	18 Mar 1915	16 Feb 1916	DNC

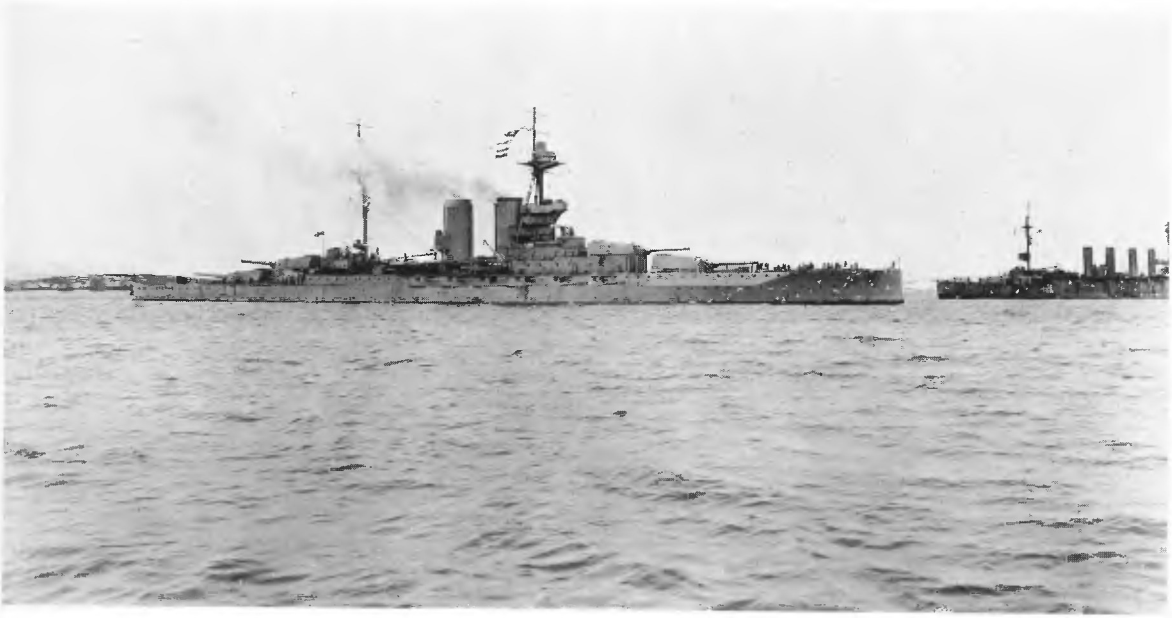
Displacement	27,544 tons.
Dimensions	600 (640 oa) x 90 ft 6 in x 28 ft 9 in [182.9 (195.1 oa) x 27.6 x 8.8]
Armament	8 x 15 in 42 cal BL, 14 x 6 in 45 cal BL, 6 x 3 pdrs. 4 x 21 in TT broadside submerged.
Armour	Waterline belt amidships 13 in, 6 in and 4 in forward. Belt aft 6 in and 4 in. Upper belt 6 in, 6 in battery. Screen bulkheads 6 in. Barbettes 10 in - 9 in - 7 in - 6 in - 4 in. CT 11 in. Decks; forward over citadel 1 in, upper 2 in - 1¼ in. Main 1¼ in. Middle 2 ½ in-1¼ in-1 in. Lower deck forward 3 in, amidships 1 in, aft 2½ in-3 in. Wing bulkheads 2 in, transverse bulkheads 2 in - 1½ in. Funnel casings 1½ in - 1 in.
Machinery	4 sets Parsons turbines by Wallsend Slipway Engineering Co. Boilers 24 Babcock & Wilcox. Designed SHP 75,000 = 25 knots.
Fuel	Oil 3412 tons maximum
Complement	1042

General

The first warship to be laid down at High Walker. MALAYA was one of five QUEEN ELIZABETH class battleships of the 1912 programme. They were armed with only 8 - 15 in guns, sacrificing the fifth turret and adopting oil fuel only to achieve a speed of 25 knots without an inordinate increase in dimensions. MALAYA was an additional ship to the class, the cost of her construction being paid for by the Federated Malay States.

Career

Grand Fleet 1916-19. Sustained eight hits from large shells at Jutland. Major refit 1934-36. Mediterranean 1940 and later Force H stationed at Gibraltar. Took part in D Day bombardment. Allocated to the British Iron and Steel Corporation (BISCO) 20 February 1948, sold to Metal Industries Ltd and arrived at Faslane for breaking up 12 April 1948.



MALAYA as completed, 1916. Note small box mounting for the searchlight on her after funnel, and the single 6 in gun in shield on the forecastle deck just forrard of the mainmast - said to be worth the whole upper deck battery in anything but a flat calm.

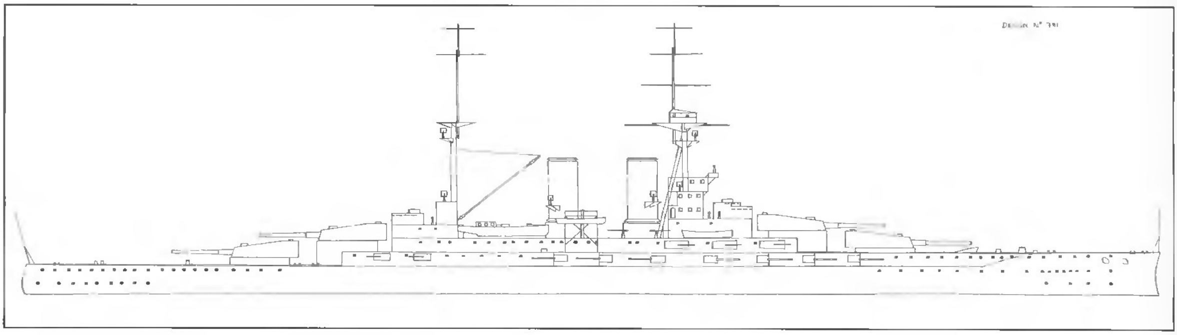
Photo : NMM N16832

RIACHUELO

Brazil

Design No	Yard & No	Laid down	Designer
781	High Walker 879	Never commenced	J R Perrett

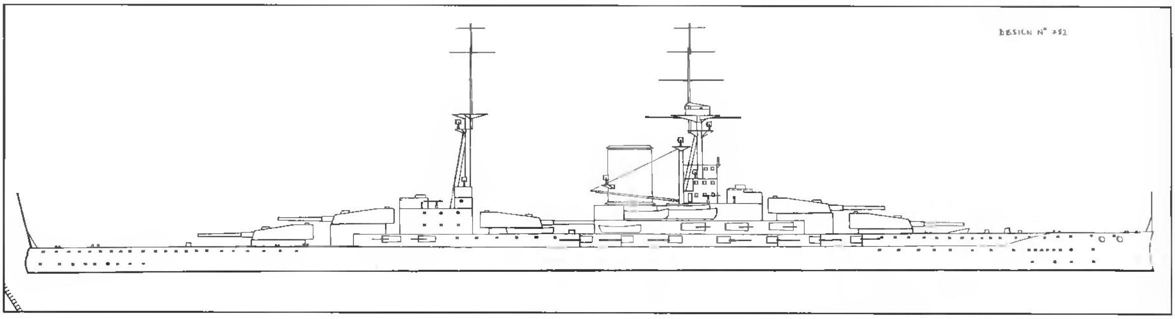
Displacement 30,500 tons.
Dimensions 620 x 94 x 28 [188.98 x 28.65 x 8.53]
Armament 8 x 15 in, 14 x 16 in in upper deck battery,
10 x 4 in: 6 on forecastle deck, 4 on upper deck, 3 x 3 in anti-balloon guns,
4 x 3 pdr. 2 x 21 in TT submerged broadside.
Armour Belt 13½ in - 6 in - 4 in, middle belt 13½ - 9 in, upper belt 9 in.
Screen bulkheads 9 in - 7 in. Upper deck battery 6 in. Barbettes 13 in - 11 in - 3 in.
Decks: lower 2 in - 2½ in, middle 1¼ in, protective 1 in - 1¼ in, upper 1½ in - ¾ in.
Magazine protection 1½ in - 1 in. CT 13 in.
Machinery 4 shaft turbines, manufacturers not specified.
Babcock & Wilcox watertube boilers to burn oil with coal.
Designed speed 22.5 knots. No designed SHP given.
Fuel Coal 3500 tons max. Oil 700 tons max.



Design 781, RIACHUELO as ordered but never laid down.

Design 782

Dimensions 670 (710 oa) x 96 x 28 [204.22 (216.41) x 29.26 x 8.53]
Displacement 34,250 tons.
Armament 10 x 15 in: remainder as 781.
Armour As 781
Machinery/Speed As 781
Fuel Coal 4000 tons max. Oil 750 tons max.



Design 782, the alternative offered to Brazil with 2 more 15 in guns, and uptakes led to a single large funnel.

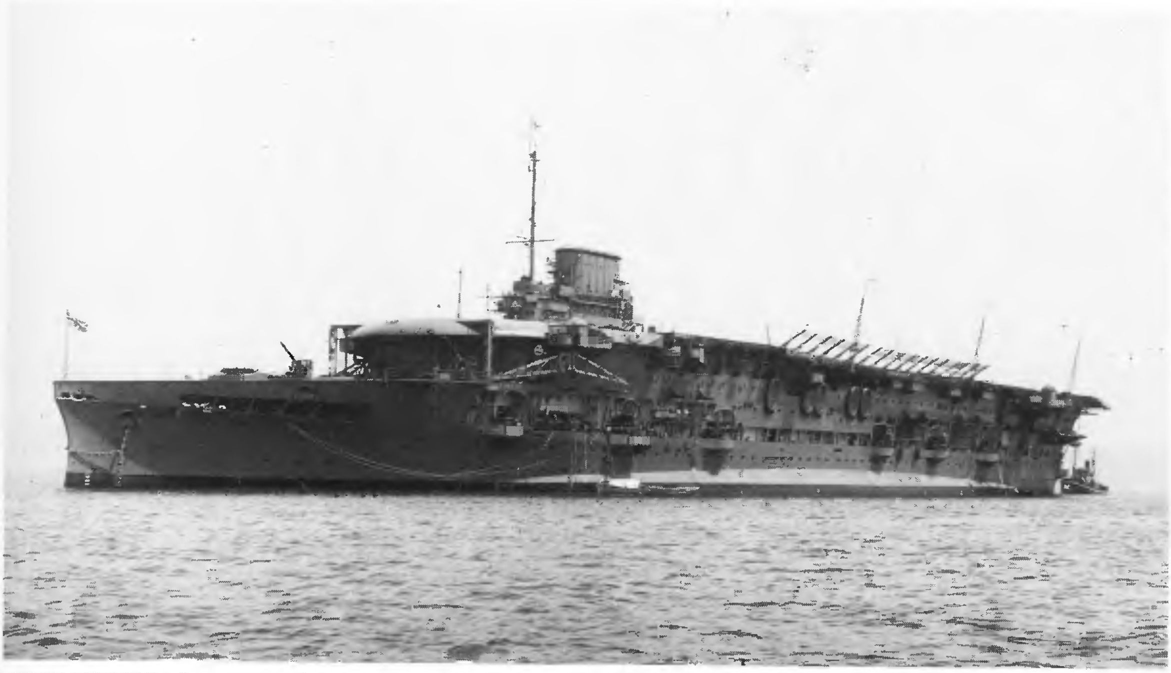
General

Having sold the RIO DE JANEIRO in 1913 the Brazilian Government asked for new designs from both Armstrongs and Vickers. Armstrongs responded with eight designs. Four of these were armed with eight 15 in guns, speeds ranging from 22½ to 23 knots and displacing 28,000 to 30,750 tons. A further four designs mounted ten 15 in guns, had speeds of 22½ to 24 knots and displaced 32,500 to 34,500 tons. Plans of only two designs, 781 and 782, appear in Design Portfolio three. Both these designs were sent to Brazil on 27 February 1914 and the contract for Design 781 was signed on 14 May 1914 and given the yard number 879. On 16 July 1914 some material had been assembled and preparations for laying down 781, now named RIACHUELO, were scheduled for 10 September, but in November it was recorded that little work had been done because of the outbreak of the war. On 14 January 1915 construction was put in abeyance, the ship never reaching the laying down stage and was officially stopped on 13 May 1915. Carrying the same armament as the ROYAL SOVEREIGN class, she was longer, probably better protected and of about the same speed.

COURAGEOUS
Great Britain

Yard & No	Laid down	Launched	Final Trials	Designer
High Walker 895	28 Mar 1915	5 Feb 1916	6 Jan 1917	DNC

Displacement	17,848 tons on trials.
Dimensions	735 (786 ft 6 in oa) x 81 x 21 ft 6 in [224 (239.6 oa) x 24.7 x 6.6] Freeboard forward 30 ft, amidships 23 ft, aft 17 ft.
Armament	4 x 15 in BL, 18 x 4 in BL (triple mounts), 2 x 3 in HA, 1 x 12 pdr 8 cwt field gun, 4 x 3 pdr QF. 2 x 21 in TT submerged beam.
Armour	Belt 3 in from 3 ft below water line to forecastle deck, forward 2 in from 1 ft 6 in below LWL to forecastle deck. Barbettes 7 in - 6 in. CT 10 in. Decks: main 1 in slopes ¾ in flats; forecastle and upper deck 1 in. Bulkheads to boiler rooms 1½ in; magazines 1 in.
Machinery	4 shaft Parsons geared turbines by Parsons Marine Steam Turbine Co. 18 Yarrow small tube boilers. SHP 90,000 = 32 knots designed.
Fuel	Oil 3250 tons.
Complement	744.



COURAGEOUS after conversion to aircraft carrier in Home Fleet dark grey livery, 1932-33

Photo : NMM N20439

General

Designed for service in the shallow waters of the Baltic. Initially classed as a "Large Light Cruiser" later reclassified as a Battlecruiser. Converted into an aircraft carrier 1924-28 at Devonport Dockyard with superimposed double hangars and an island incorporating a funnel and bridge.

Career

Served with 3rd LCS and 1st CS, Grand Fleet until 1918. Took part in the second battle of the Heligoland Bight 17 November 1917. After conversion between the wars served with the Atlantic and Home Fleets. Torpedoed and sunk by U29, 17 September 1939.

FURIOUS
Great Britain

Yard & No	Laid down	Launched	Left Tyne	Designer
High Walker 896	8 Jun 1915	15 Aug 1916	2 Jul 1917	DNC

Displacement 18,385 tons designed. 22,890 tons deep.

Dimensions 735 (786 oa) x 88 ft 1 in x 21 [224 (239.6) x 26.9 x 6.4]

Armament

Designed	As originally completed	As modified 1918
2 x 18 in BL	7 or 8 aircraft	12 - 20 aircraft
(15in "B" in SPB)	1 x 18 in BL	
8 x 5.5 in BL	9 x 5.5 in BL	10 x 5.5 in BL
2 x 3 in HA	5 x 3 in HA	5 x 3 in AA
4 x 3 pdr		
6 x 21 in TT	18 - 21 in TT	14 - 21 in TT
(2 submerged, 4 aw)	(2 submerged, 16 aw)	(2 submerged, 12 aw)

Armour 3 in HT main belt amidships from 4 ft 6 in below LWL to forecastle deck.
2 in HT forward from 3 ft below LWL to forecastle deck.
Barbettes front 7 in, rears 6 in. Supports 4 in - 3 in KC. Bulkheads 3 in and 2 in.
Decks: lower, forward 1 in, aft 3 in - 2 in - 1½ in - 1 in; main, 1 in slope ¾ in flat; forecastle and upper 1 in. Wing bulkhead in boiler and engine rooms 1 in.

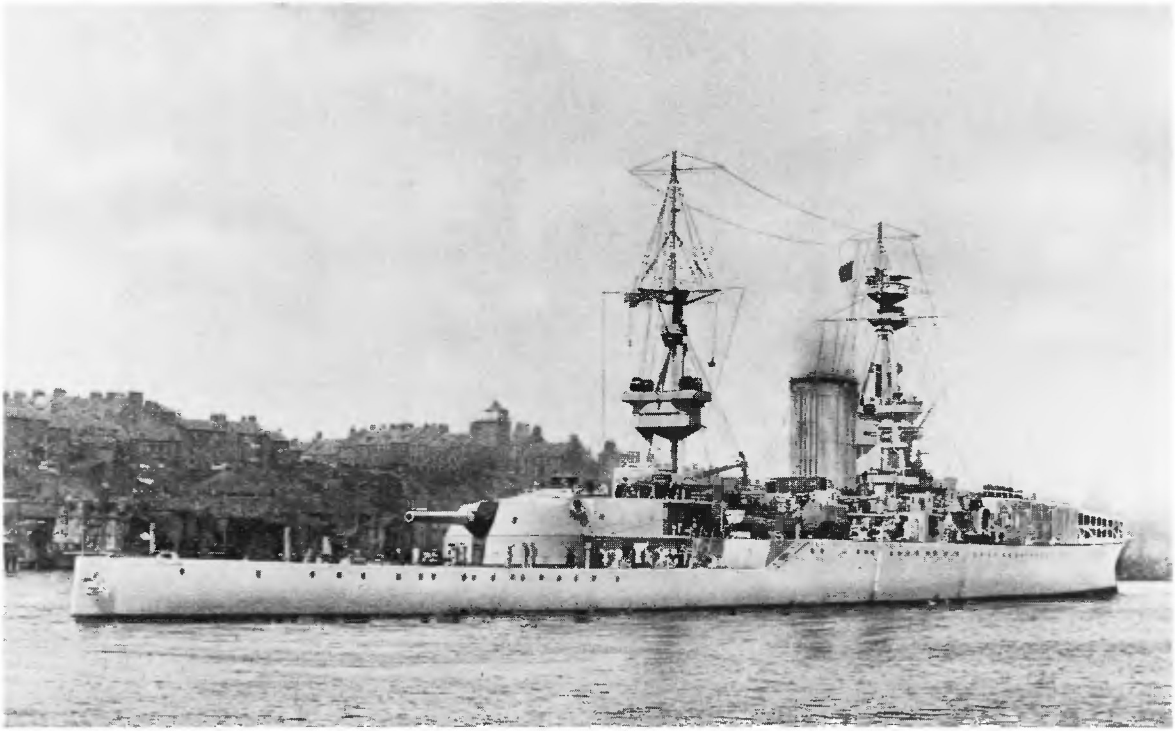
Machinery Four sets Brown Curtis geared turbines by Wallsend Slipway & Engineering Co.
18 Yarrow small tube boilers. SHP 90,000 = 32 knots designed.

Fuel 3393 tons oil.

General

Designed as a "Large Light Cruiser". A half sister to COURAGEOUS with single 18 mountings (described for purposes of security as 15 in "B") replacing the twin 15 in turrets and with 5.5 in replacing the 4.in. Before completion a decision was made to replace the forward turret by a hangar and flying off deck. This caused a delay in completion of about six weeks. FURIOUS served with the Grand Fleet July to October 1917. In September 1917 a decision was made to add a landing-on deck aft, and this work, which involved removing the aft 18 in gun, was completed at Armstrongs by March 1918.

In March 1921 the DNC submitted plans for FURIOUS to be converted to a flush decked carrier; preliminary cutting down to the upper deck took place at Rosyth Dockyard and she was transferred to Devonport Dockyard early in 1922 for the conversion to be completed. In 1925 she emerged with a superimposed second hangar deck, a short flying-off deck forward on to which this hangar opened and a seaplane handling platform over the quarterdeck. She had a number of refits and modifications between the wars, the last of which in 1938-39 added a small island and altered her armament to six twin 4 in AA mountings.

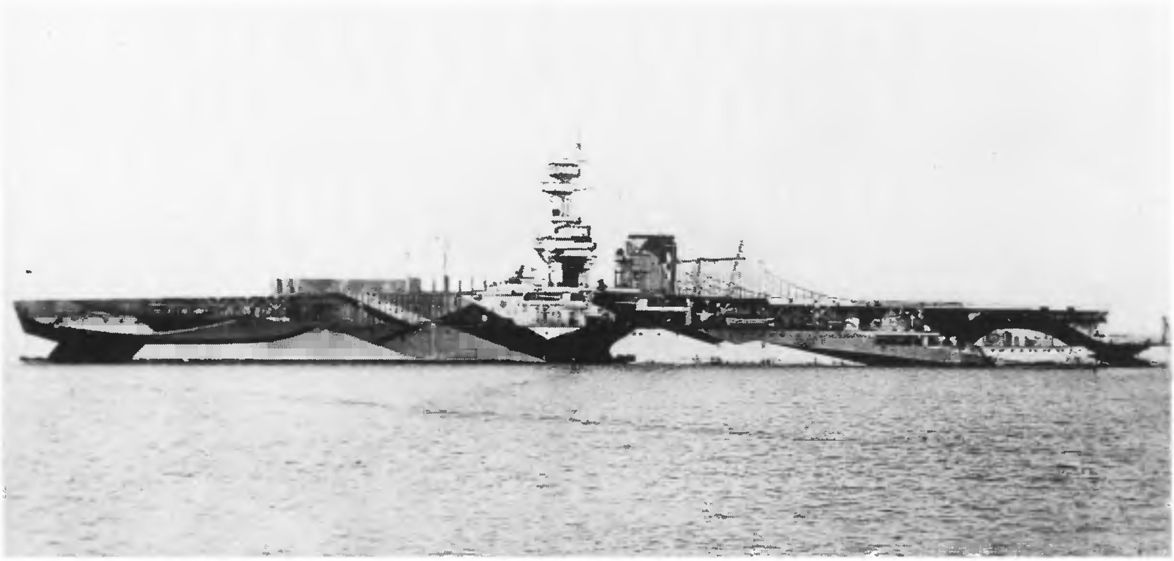


FURIOUS as completed with hangar and flying off deck forward, 18 in gun aft, 1917

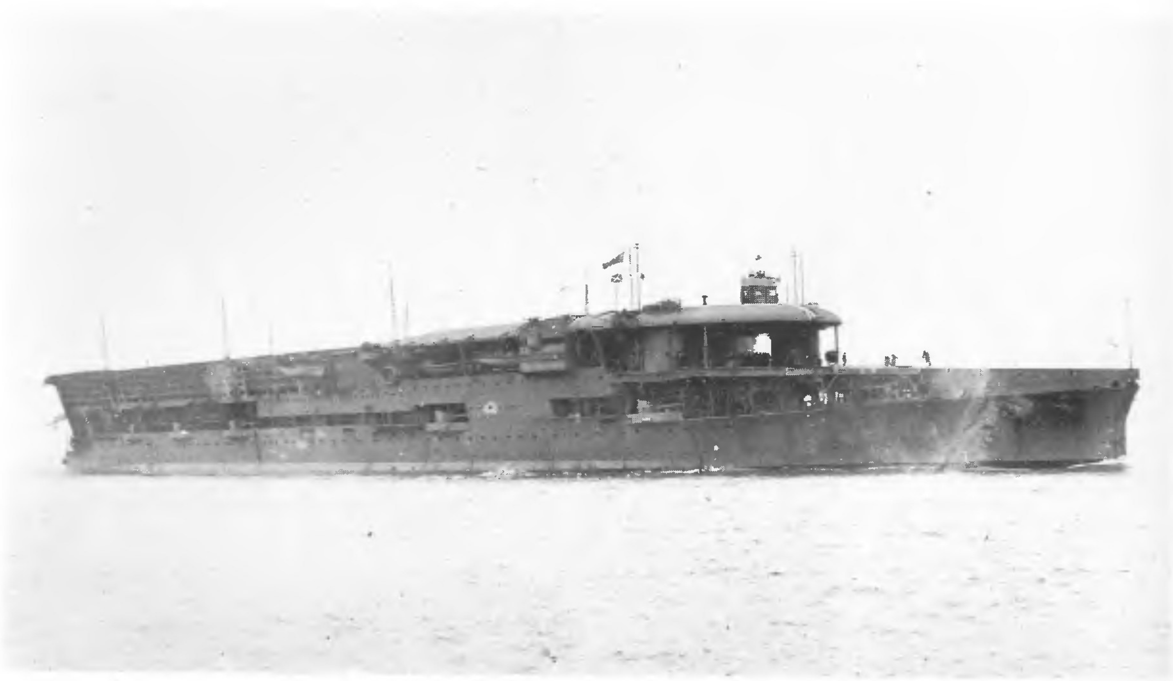
Photo : Author's collection

Career

Grand Fleet 1917-18. Decommissioned 1919 while awaiting decision as to her future. After conversion Home and Mediterranean fleets. World War Two, Home Fleet in Arctic and Atlantic. Ferried aircraft to West Africa and Malta. Placed in reserve 1944. Handed over to BISCO and arrived at Dalmuir for breaking up 15 March 1948.



FURIOUS in 1918, with flying decks fore and aft, and in dazzle paint. Photo : MPL



FURIOUS in 1926, after conversion to a flush-decked aircraft carrier. Her retractable navigating bridge is raised. When flying off the upper flight deck this was lowered and the ship navigated from under the rounded front of the deck.
Photo : NMM N/O 383

ANSON
Great Britain

Yard & No	Laid down		Designer
High Walker 909	10 Nov 1916	Cancelled 17 March 1919	DNC

Displacement	40,958 tons
Dimensions	810 x 104 x 28 ft 3 in [246.9 x 31.7 x 8.6]
Armament	8 x 15 in BL, 16 x 5.5 in BL, 4 x 4 in HA, 4 x 3 pdr, 2 x 21 in TT submerged broadside.
Armour as first designed	Belt 12 in amidships, forward 6 in - 5 in, aft 5 in. Barbettes 12 in - 10in. CT 12 in. Decks: lower 3 in - 1 in, middle 3 in - 1 in, upper 2 in - 1¼ in, wing bulkheads 1½ in - ¾ in. Funnel casing 2 in - 1 in.
Machinery	Geared turbines by Hawthorn Leslie. Designed SHP 144,000 = 31 knots.
Fuel	Oil 4000 tons.

General

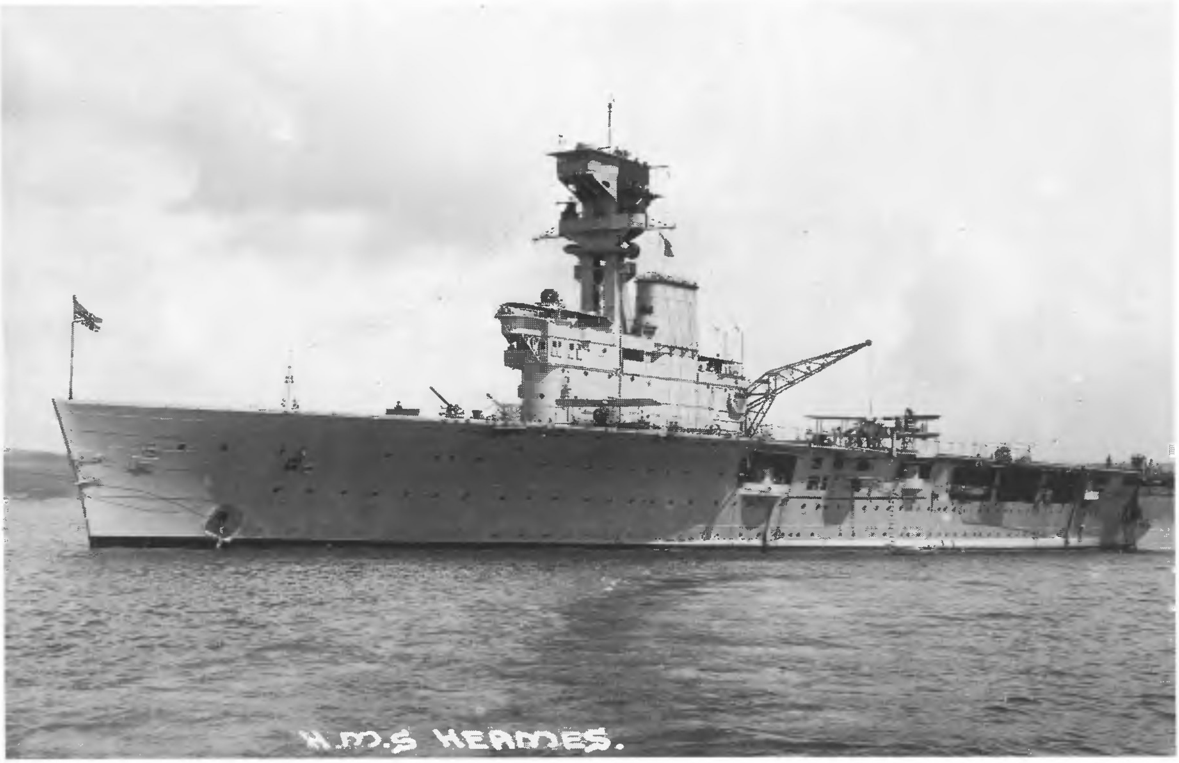
Originally to be one of three sister ships to HOOD; construction was suspended in March 1917 so that machinery and labour could be devoted to ships regarded as of higher priority. In 1918 extensive modifications were proposed which would have put ANSON, HOWE and RODNEY into a separate class, possibly to be known as the HOWE type. Changes would have included placing A, B and X magazines under the shell rooms, increased protection to magazines and engine rooms, main turrets of different sizes with the crowns increased by 1 in, together with modifications to belt and barbette protection. The above water torpedo tubes in the original HOOD design would have been omitted and the bridge and the conning tower much modified. In February 1919 the Board of Admiralty decided that in view of the design being weak and three years out of date, the three ships would be cancelled and letters of cancellation were sent out on 17 March.

HERMES

Great Britain

Yard & No	Laid down	Launched	Designer	
High Walker 939	15 Jan 1918	1 Sep 1919	Towed away for completion at Devonport June 1920	DNC

Displacement	10,377 tons designed.
Dimensions	548 ft 2 in (576 ft 8 in wl 593 ft oa) x 70 ft 1 in over bulges x 18 [167.1 (175.8 wl 181 oa) x 21.3 over bulges x 5.5] Freeboard at bow, 33 ft 3 in.
Armament	As designed: 10 x 6 in BL, 4 x 4 in HA. As completed: 6 x 5.5 in BL, 3 x 4 in HA. Aircraft 12 - 20
Armour	Sides 2 in over $^{3}/_{4}$ in HT from 4 ft 3 in below LWL to hangar deck for about 518 ft amidships. Fore and aft $1^{1}/_{2}$ in over $^{5}/_{16}$th in HT.
Machinery	2 sets geared turbines by Parsons Marine Steam Turbine Co. 6 Yarrow boilers. Designed SHP 40,000 = 25 knots.
Fuel	Oil 2722 tons.



HERMES in 1924, shortly after completion. Photo : NMM N20433

General

HERMES was completed at Devonport Dockyard inJuly 1923. She was the first British aircraft carrier designed as such, and not a conversion. She was too small and slow to be an effective carrier even when built and was obsolete by the start of World War Two.

Career

HERMES spent most of her life in the Far East. Sunk by Japanese bombers off the east coast of Ceylon (Sri Lanka) on 9 April 1942.

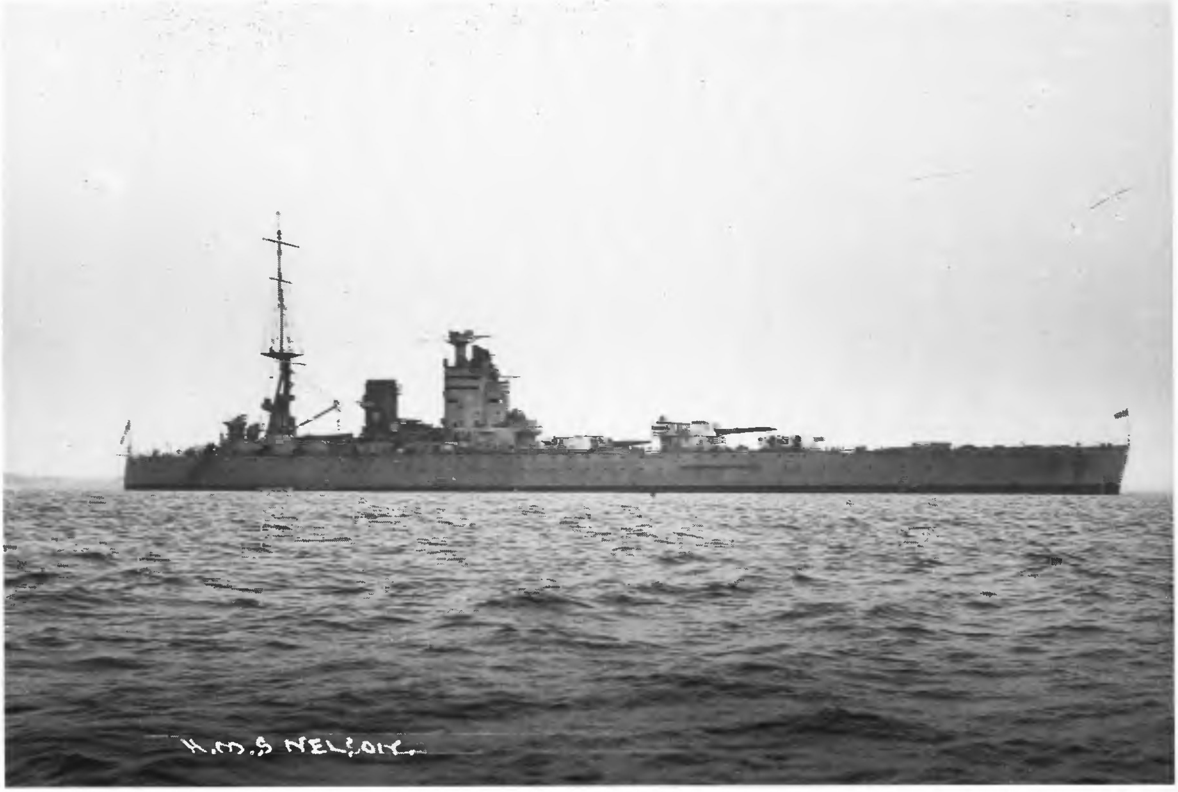
NELSON
Great Britain

Yard & No	Laid down	Launched	Final trials	Designer
High Walker 991	28 Dec 1922	3 Sep 1925	10 Aug 1927	DNC

Displacement	33,313 tons standard.
Dimensions	660 (710 oa) x 106 x 28 ft 1 in [201.2 (26.4) x 32.3 x 8.6]
Armament	9 x 16 in 45 cal, 12 x 6 in 50 cal, 6 x 4.7 in 40 cal QF HA, 6 x 2 pdr single pom poms, 4 x 3 in pdr QF. 2 x 24 in TT submerged beam.
Armour	Belt 14 in - 13 in. Bulkheads 12 in - 4 in. Barbettes 15 in - 12 in. 16 in turrets, 16 - $7^1/_4$ in. 6 in turrets $1^1/_2$ in - 1 in. CT 14 in. Deck: middle $6^1/_4$ over magazines, 3 $^3/_4$ over machinery; lower, aft $4^1/_4$ in. Torpedo bulkheads $1^1/_2$ in.
Machinery	2 shaft Brown Curtis geared turbines by Wallsend Slipway & Engineering Co. 8 Admiralty 3 drum boilers. SHP 45,000 = 23 knots.
Fuel	Oil 3805 tons.
Complement	1314 (1361 as flagship)

General
NELSON and her sister ship RODNEY were Britain's first post-Great War battleships, being built to the restrictions imposed by the Washington Naval Treaty.

Service
Atlantic and Home Fleets between Wars. World War Two, Home Fleet and in Bismarck action; Mediterranean; Normandy landings; East Indies Fleet. Arrived at Inverkeithing 15 March 1949 to be broken up by T W Ward.



NELSON soon after completion in 1927

Photo : NMM N20289

CHAPTER 6
TORPEDO CRAFT & SUBMARINES

Introduction

The Whitehead self-propelled torpedo was introduced into the Royal Navy in 1870, with other countries quickly following Great Britain's lead. The first torpedo launch was built for Norway in 1873 by Thornycroft. Four years later LIGHTNING, the Royal Navy's first torpedo boat, fully decked and capable of steaming in "a tolerably rough sea" was built by the same firm. In the next decade first class torpedo boats of all nations had greatly increased in size, armament, speed and effectiveness. This is demonstrated below using the Royal Navy as an example. Particularly striking is the almost threefold increase in endurance.

Number **Builder**	**No 1** Ex LIGHTNING Thornycroft	**No 80** Yarrow
Year of Launch	1877	1887
Dimensions (feet)	87 x 10½ x 5½	135 x 14 x 8½
Displacement	26 tons	87 tons
Speed	18 knots	23 knots
IHP	436	1539
Coal	4½ tons	32 tons
Radius @ full speed	140 miles	420 miles
@ Economical speed	990 miles	2850 miles
Armament	1 bow training TT	1 bow fixed 2 training TT
	2 x 1 in Nordenfelt mg	3 x 3 pdr QF

To meet the potential menace of scores of craft like No 80 attacking a slowly moving battlefleet, a defence was necessary. Torpedo boats accompanying the fleet were not an adequate solution as they were too frail, their nominal speed was greatly reduced in any seaway, and their endurance limited, measured not only in terms of coal carried, but, more importantly by what their crews could endure. Except in the calmest of waters sleep would be near impossible because of the incessant motion, vibration and cramped quarters, and it would be difficult to provide hot food and drink. All these factors would reduce the crew's efficiency. What was needed was a vessel large enough to keep the sea in all weathers and with their crews in reasonable shape, with good endurance, and gunpower sufficient to deal with attacking torpedo boats. At the same time they needed to be of limited tonnage so that they would be cheap and thus built in affordable numbers; limited displacement also meant shallow draft which would give some safety from torpedoes. Most of all they needed speed to run down torpedo boats - speed which had to be maintained in a seaway.

Three successive attempts were made to meet these requirements. First in time was the torpedo cruiser of 1000-1600 ton displacement; these were never fast enough and as they grew larger and more heavily gunned they merged into the protected cruiser type. They were replaced by the torpedo gunboat of 550 - 950 tons. They were more successful but they too lacked speed – or so it was considered at the time. The final solution was to produce enlarged torpedo boats with a heavy gun armament and superior speed to any torpedo vessel. This type was originally called a torpedo boat destroyer and then destroyer; in turn the destroyer took on the offensive role of the torpedo boat, as well as the defensive role of repelling torpedo attacks on their own fleet.

Armstrongs, although not specialist torpedo boat builders, produced vessels of all three types. Their two torpedo cruisers were probably the most successful of the small number of this type that were constructed. They built four torpedo gunboats for the Royal Navy and the Royal Indian Marine and the TATSUTA for Japan. In addition they bought two craft built by other ship builders which had not found ready sales to foreign navies and modified them. These were the BUENO VENTURA which became the Brazilian GUSTAVO SAMPAIO and the Cowes-built SEA SERPENT, later FEI TING.

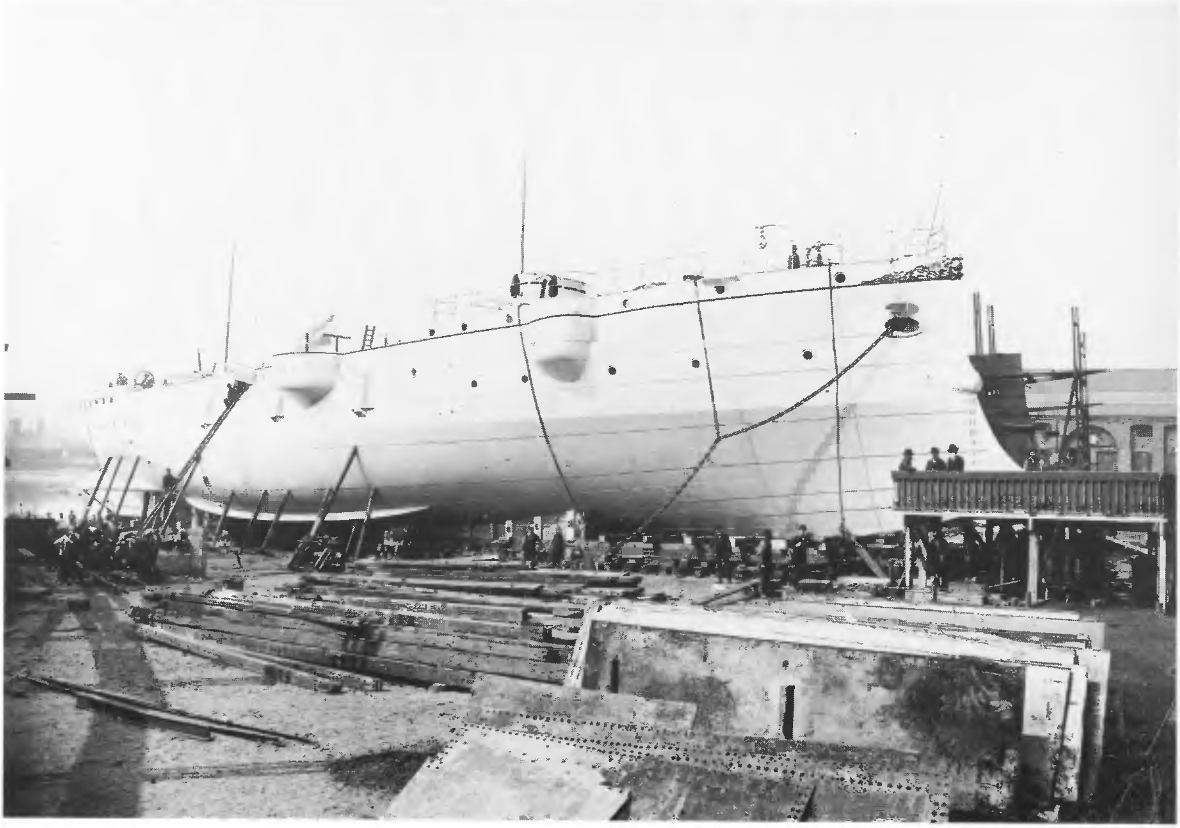
Armstrongs record in the field of destroyer construction was not successful and COBRA, although very fast, foundered possibly as a result of poor design and construction. Several years later AFRIDI, a large turbine-engined destroyer, was laid down for the Admiralty, but no more destroyers were laid down after this, doubtless due to AFRIDI's excessively long building time.

TORPEDO CRUISERS

The first of these was the German ZIETEN built in England in 1876; she attained the then high speed of 16 knots and was well armed with two torpedo tubes and four 120 mm BLR. Similar vessels were built by other countries but all were failures because of low speed. In 1882 the French Navy produced the CONDOR class, the first really successful torpedo cruisers. On a displacement of 1280 tons they had a complete steel deck with a maximum thickness of 1½ in, were armed with five 3.9 in guns and five torpedo tubes and could steam 17-17½ knots.

The Royal Navy's answer to the CONDORs was SCOUT and FEARLESS of 1430 tons, armed with four 5 in BL and designed to carry 11 torpedo tubes and launchers, one of which was submerged; as completed they mounted the submerged tube and two above water launchers only. With natural draft they attained 16½ knots and with forced draft 17½ knots; they were indifferent seaboats and were not a success.

Prompted by the building of this pair, the Austro-Hungarian Navy, through their naval attaché in London, Baron von Haan, requested designs and tenders for a torpedo cruiser from leading British firms. The specification was for a 1500 ton ship capable when fully loaded of steaming 17 knots with natural draft. William White produced designs in late April 1884; in late June the Armstrong tender was accepted with modifications which necessitated lengthening the ships by 4 feet and substituting a closed in, full height, poop for the original turtle back deck at the stern. The contract for two fast torpedo cruisers of about 1530 tons was signed on 18 September 1884.



PANTHER on the stocks almost ready for launching, June 1885. PANTHER was the first ship to be launched from the new Elswick yard. The bow of LEOPARD can be seen beyond PANTHER's.

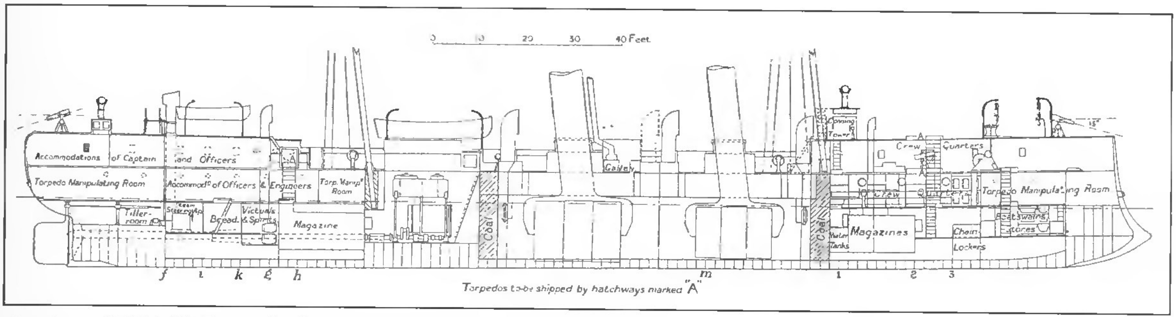
Photo : NMM P39502

PANTHER LEOPARD

Austria-Hungary

Yard & No	Laid down	Launched	Final trials	Designer
PANTHER Elswick 480	11 Sep 1884	13 Jun 1885	16 Dec 1885	W H White
LEOPARD Elswick 481	4 Dec 1884	10 Sep 1885	1 Feb 1886	W H White

Displacement	1552 tons.
Dimensions	224 (239 oa) x 34 x 14 [68.28 (72.85 oa) x 10.36 x 4.27]
Armament	2 x 4.7 in (12 cm) 35 cal Krupp, 10 x 47 mm HRC. 4 TT, aw, 2 fixed bow and stern and 2 training broadside. Rearmed before World War One with 4 x 7 cm QF.
Armour	¾ in covers over engine rooms. ⅜ in deck over boilers. 2½ in CT.
Machinery	2 sets vertical compound by R & W Hawthorn. 4 double-ended cylindrical boilers Designed IHP ND 4000 = 17 knots, IHP FD 6500 = 18 knots.
Fuel	Coal. 150 tons normal, 338 tons maximum.
Complement	150.



Section of PANTHER and LEOPARD, from Manning, p 136

General

The 4.7 in guns were carried in sponsons, one on each broadside. There were eight main transverse watertight bulkheads rising to the level of the main deck, six to seven feet above water. The boilers and engines were protected by coal bunkers on each side, while the boilers had a layer of coal above them. Two transverse bunkers were fitted, before and aft the boilers, in order to provide some protection from raking fire.

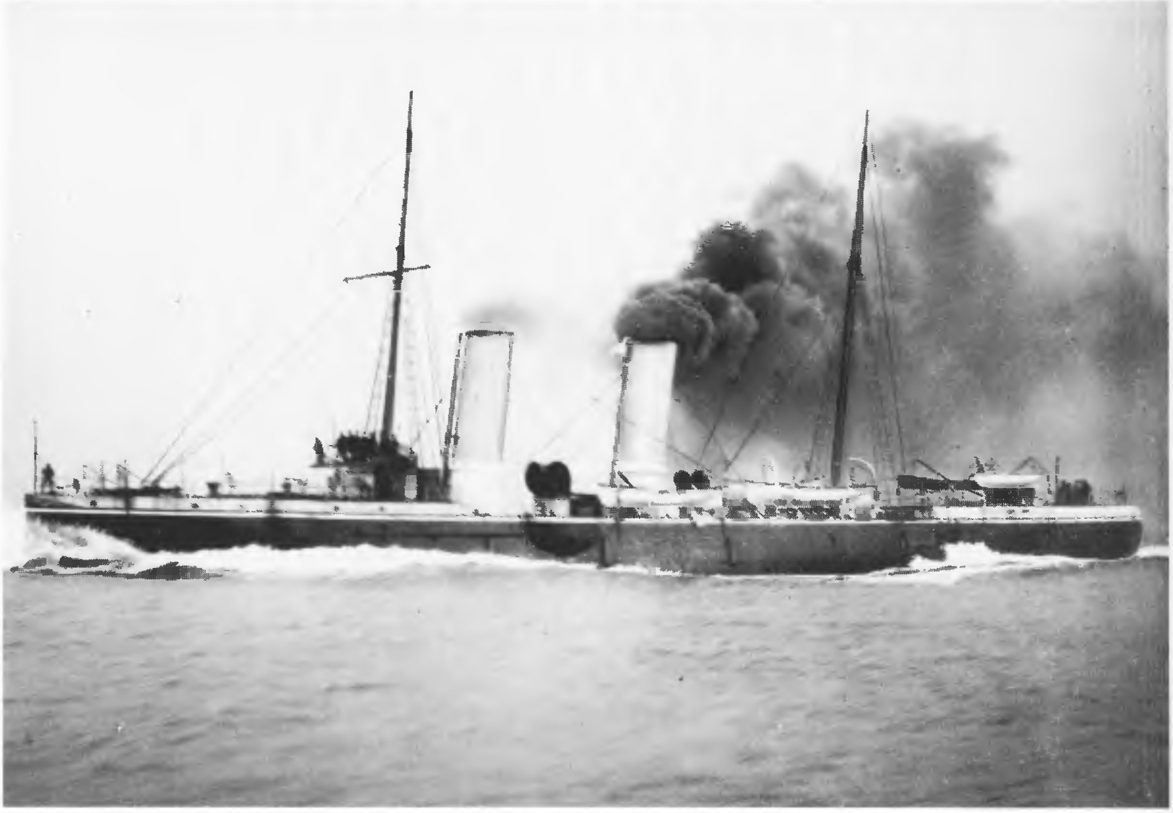
White opted to have compound rather than triple expansion engines on the grounds that the former were lighter and took up less space. Conceding that the triple expansion type were better for large slow running engines he believed that they offered no advantage for quick running ones. However, the engines were mounted vertically at the Austrian's request, the advantages being that vibration was less than with the horizontal arrangement and the length of the engine room was reduced as they could be mounted side by side; their single engine room was 26 feet long compared with the CHIH YUAN's twin engine rooms with a total length of 48 feet developing only 900 IHP more than PANTHER. The only disadvantage was that the cylinders were above the waterline, but protection was given by coal bunkers and steel covers.

The designed speed at full load was high for a small vessel of that date, and should be compared with SCOUT's designed 16 knots with forced draught on light displacement. White was hoping to obtain 19 knots with forced draught but here he was disappointed. On trial with natural draught and 4,500 IHP PANTHER achieved 17.64 knots on the measured mile and on a four hour trial steamed 70.6 knots against the 64 knots fixed by contract. At the end of a 24 hour trial she made 18.4 knots with forced draught and IHP 5940. In the Mediterranean PANTHER's IHP was 4781 giving 18 knots with natural draught and with forced draught 6520 IHP giving 18.94 knots. LEOPARD's trial with forced draught was IHP 6385 giving 18.59 knots.

White, seeking to explain why the hoped-for 19 knots had not been achieved, first maintained that the engine cylinders had been made too small in order to keep weight down, but later placed the blame on the fan engines needed for forced draught which drew large quantities of steam from the boilers. However, Siegfried Popper, Austria-Hungary's leading naval architect, who had supervised the building of the PANTHER on behalf of the Austrians, thought that if more stokers had been used in the Mediterranean trials 19 knots would have been made.

They were the first ships to be built in the Elswick Yard, which was still in the course of construction at the time; some of the work on frames and beams was done at Walker.

Armstrong's tendered for a third vessel of this type but were unsuccessful. This third ship, the slightly larger TIGER, was eventually built at Trieste by Stabilimento Tecnico Triestino.



PANTHER running trials off the Tyne, December 1885 Photo : NMM P39503

Careers

PANTHER
Adriatic 1885-91. From 1896 to 1898 she was a station ship in East Asia. She was in reserve 1903-5; in East Asia and Australia 1905-6, returning to Trieste where she was a station ship from 1907-8 undergoing a refit in the last year. She was employed in East Asia 1909-10, and was then based in Trieste 1910-14. For the first three years of World War One she was part of the Adriatic fleet, serving as guardship in the Gulf of Kotor; in the last year of the war she was a school and accommodation ship.

LEOPARD
After initial service in the Mediteranean she was in Australia and East Asia 1900-01 acting as a cadet training ship. She served again in East Asian waters as a station ship 1907-9; throughout World War One she was a guardship in Fasana.

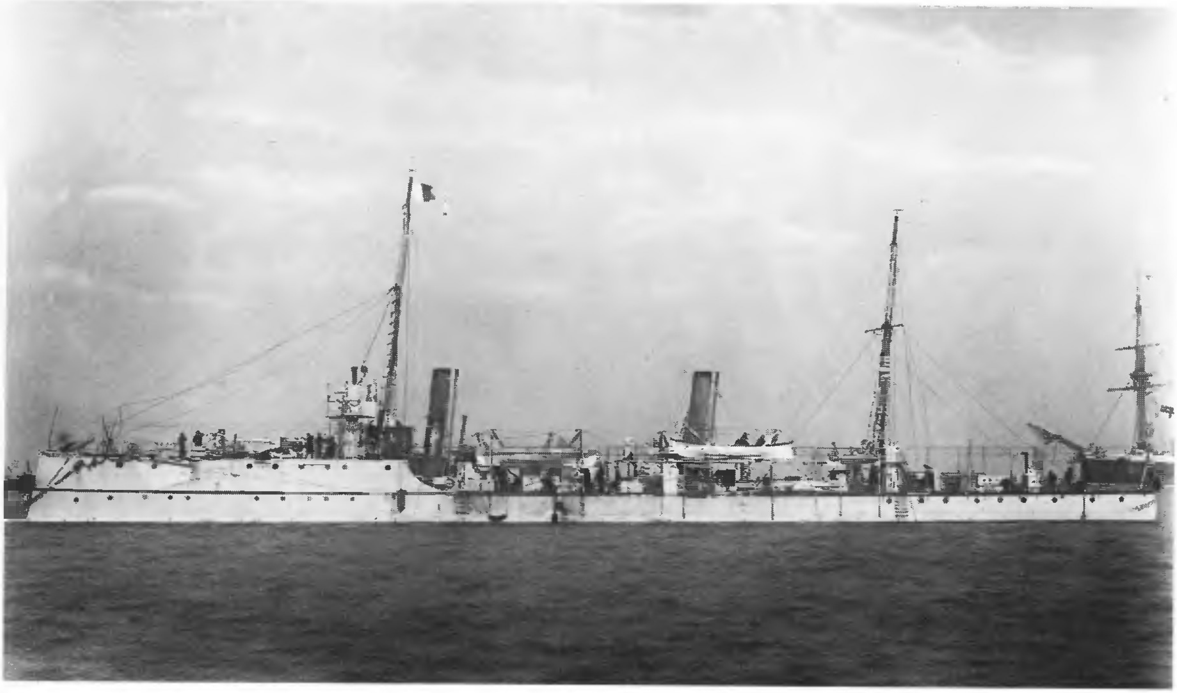
Both were allocated to the UK as war reparations but were sold to Vaccaro & Co and broken up at Messina in 1921.

TORPEDO GUNBOATS

The first vessel of this type, the BOMBE, was laid down a few months after the torpedo cruiser CONDOR; both types were designed by M. de Bussy. BOMBE displaced 395 tons and was originally armed with two 3 pdr QF and five 1 pdr revolving cannon with two 14 in above water torpedo tubes; the gun armament was soon changed to four 3 pdr and three revolving cannons. Designed for 19 knots with forced draught the locomotive boilers gave problems, with the result that the BOMBE took one month short of five years to complete. She was followed by seven sisters. Other countries followed suit, notably Spain, who commissioned the Clydebank firm of Thomson to build a well-armed torpedo vessel capable of 22 knots at normal load with a radius of about 1800 miles; with her full bunker capacity of 110 tons she had a nominal radius of 5500 miles. On trials in late 1886 she made 22 ½ knots at designed draft, displacing 385 tons, and just over 20 knots at full load when she displaced 458 tons. Called DESTRUCTOR, she carried an armament of one 9 cm BL, four 6 pdr QF, two Hotchkiss RC and three torpedo tubes. The Royal Navy followed with RATTLESNAKE of similar dimensions but half a knot slower at full load; her three sisters were not as successful from the point of view of speed. Thereafter the Royal Navy built three succeeding classes of TGBs, each of greater dimensions in an attempt to obtain greater speed, but although designed for 20 knots none bettered 19, with the exception of SPEEDY, which instead of locomotive boilers had the Thornycroft watertube type which allowed for greater forcing, so that she made 20.5 knots on trial. Armstrongs' first torpedo gunboats, BOOMERANG, KARRAKATTA, PLASSY and ASSAYE were launched between 1889 and 1891 and like the rest of their class never reached the designed speed because of inadequate boilers. Their boilers were designed to give 4500 IHP with forced draught but this degree of forcing resulted in leaky tubes; reduced air pressure meant that their IHP was re-rated to 3700.

The concept of the TGB as a torpedo boat catcher, and a more effective torpedo deliverer, was later seen as basically flawed, but SPEEDY could overtake most torpedo boats in any sort of sea except in a flat calm. It should not be forgotten that the first fully authenticated, successful attacks by the torpedo were made by TGBs; the first was in the Chilean Civil War when BLANCO ENCALADA was sunk by the ALMIRANTE LYNCH and then, three years later at the end of the Brazilian Civil War, the battleship AQUIDABAN was torpedoed by the GUSTAVO SAMPAIO.

In the realm of the fictional naval war, a popular genre in the 1890s and early 1900s, Fred Jane had RATTLESNAKE sink the 3000 ton French cruiser DAVOUT by a torpedo attack in broad daylight. Jane had spent manoeuvres on board TGBs, and his description of the GRASSHOPPER at sea makes it clear that their margin of comfort over torpedo boats was small: 'The ratings on GRASSHOPPER are berthed in a stuffy apartment less than 20 feet long. This is "the lower deck" and here often knee deep in water live some 60 of the crew, their hammocks slung three deep one above the other'.



Assaye in white tropical livery before sailing for India, 1891 Photo : IWM Q42629

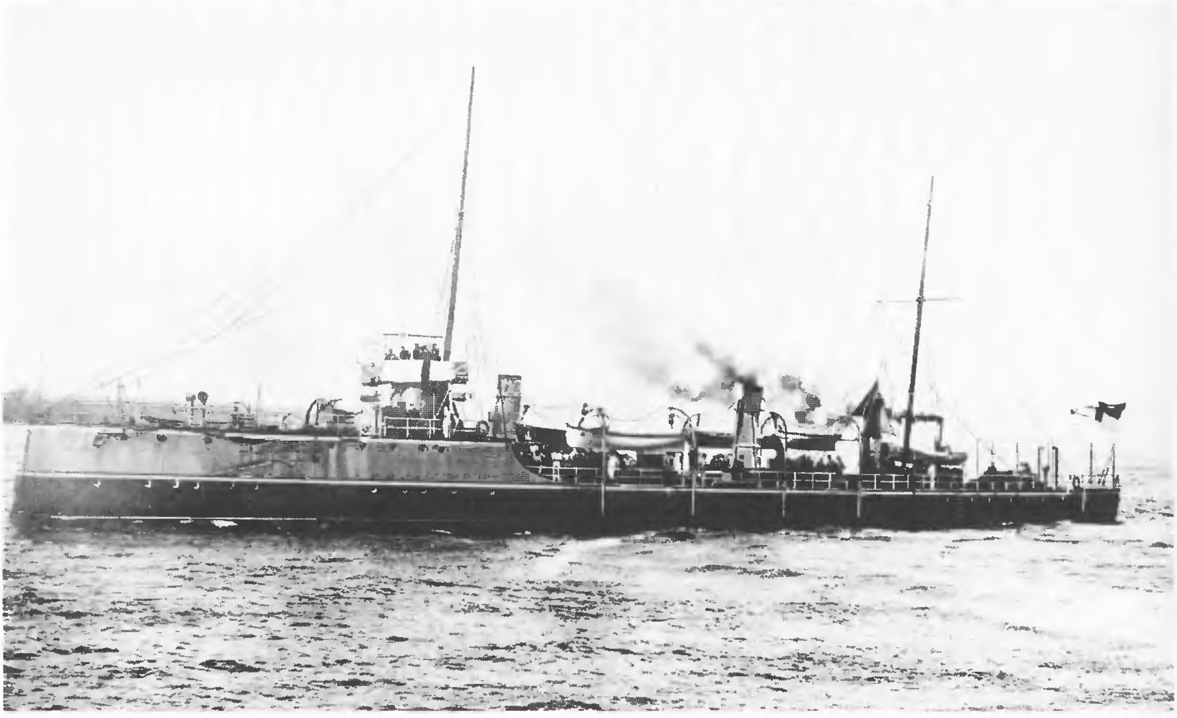
The RN TGBs had long and useful lives after their supersession by TBDs, being employed as ordinary gun boats, despatch vessels, fleet scouts and, later still, in subsidiary but important roles such as minesweepers and submarine tenders.

BOOMERANG (ex WHITING) KARRAKATTA (ex WIZARD) PLASSY ASSAYE

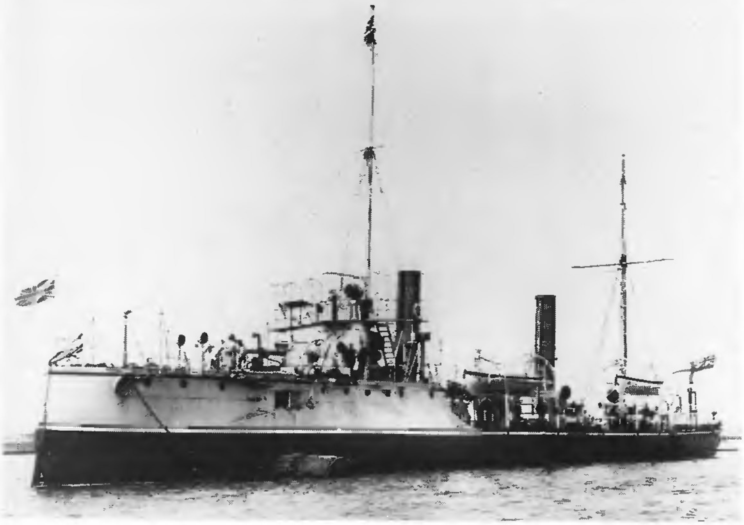
First two Great Britain, latter two, India

Yard & No	Laid down	Launched	Final trials	Designer
BOOMERANG				
Elswick 545	23 Aug 1888	24 Jul 1889	5 Nov 1890	DNC
KARRAKATTA				
Elswick 546	23 Aug 1888	27 Aug 1889	5 Nov 1890	DNC
PLASSY				
Elswick 547	Mar 1889	5 Jul 1890	8 Jul 1891	DNC
ASSAYE				
Elswick 548	Mar 1889	11 Feb 1891	24 Mar 1891	DNC

Displacement	739.4 tons. 755 tons on trial.
Dimensions	230 (241 ft 9 in oa) x 27 x 8 ft 3 in [70.1 (73.7) x 8.2 x 2.5]
Armament	2 x 4.7 in QF, 4 x 3 pdr QF. 5 x 14 in TT, 1 fixed bow, 4 training broadside.
Armour	CT 1 in.
Machinery	2 sets vertical triple expansion by Belliss for first pair and Maudslay for second pair. Four locomotive boilers. Designed IHP ND 2500 = 18.5 knots, FD 4500 = 21 knots. Trials : IHP ND 2612, FD 3840 = ca 20 knots.
Fuel	100 tons normal, 160 tons maximum.
Complement	80



KARRAKATTA as first completed, with short funnels, and with her forecastle still in undercoat grey paint. Her funnels were soon heightened. Photo : NMM P39501



BOOMERANG at a buoy as completed. Photo : IWM Q38349

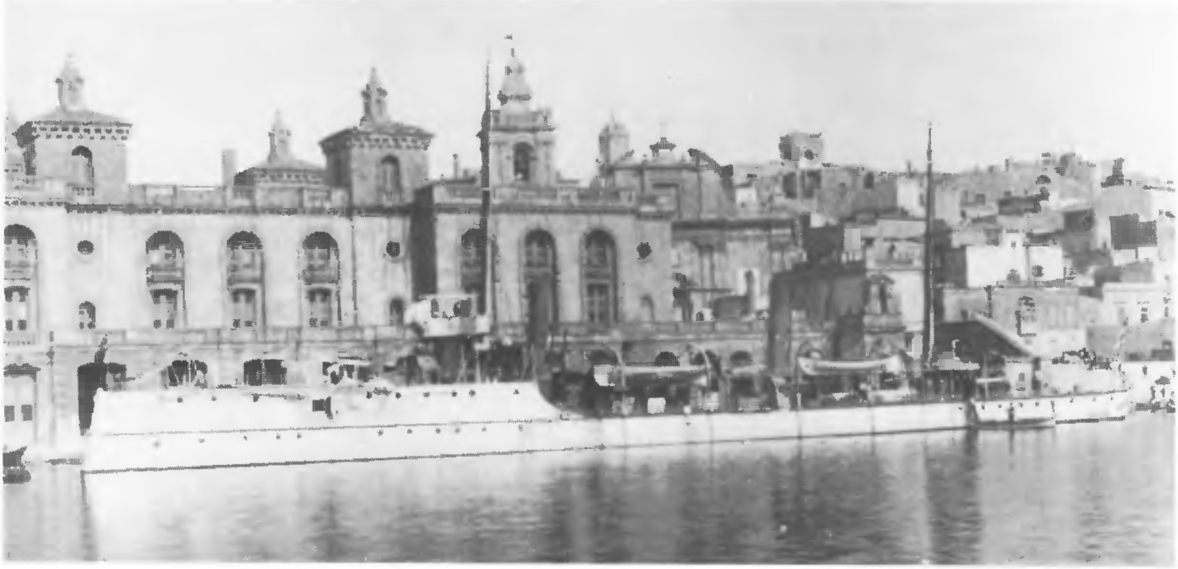
General

All four belonged to the GOSSAMER class, successors to the original RATTLESNAKEs, with an all QF armament and improved freeboard, 14 ft 2 in at the bows and 6 ft amidships. The first pair were ordered in August 1888 under the terms of the Imperial Defence Act for service in Australasian waters. Their original names were changed after launching. At BOOMERANG's first sea trials in April 1890 the guide bars for the piston crossheads heated as full speed approached, making it impossible to proceed with the trial. White metal guide bars were substituted for the brass ones fitted by Belliss. After the official ND trials had been completed the Admiralty demanded modifications to the boilers. Apparently it was on Admiralty Instructions that no FD trials were undertaken. From a statement made by the First Lord, explanatory to the 1891-92 Navy Estimates, it is clear that early trials had produced leaky boiler tubes with forced draught, and in consequence modifications had resulted in a reduced IHP of 3900, with a loss of one knot in speed.

PLASSY and ASSAYE were built for the Royal Indian Marine. On Admiralty instructions manganese bronze propellers replaced the original steel ones after one of PLASSY's propeller blades broke on trial. Both ships suffered a great deal from vibration at full speed, resulting, in PLASSY's case, in broken steam pipes causing the discontinuation of trials on two occasions. ASSAYE was launched with her boilers and machinery in place, accounting for the very short time between launch and final trials.

Career

The Australian two were based at Sydney NSW until the early years of the century, returning to Britain to be scrapped in 1905. Both were sold 11 July 1905 at Portsmouth. The Royal Indian Marine pair were based at Bombay for a number of years; they returned to England in 1904. ASSAYE was sold May 1904 and PLASSY 17 May 1904.

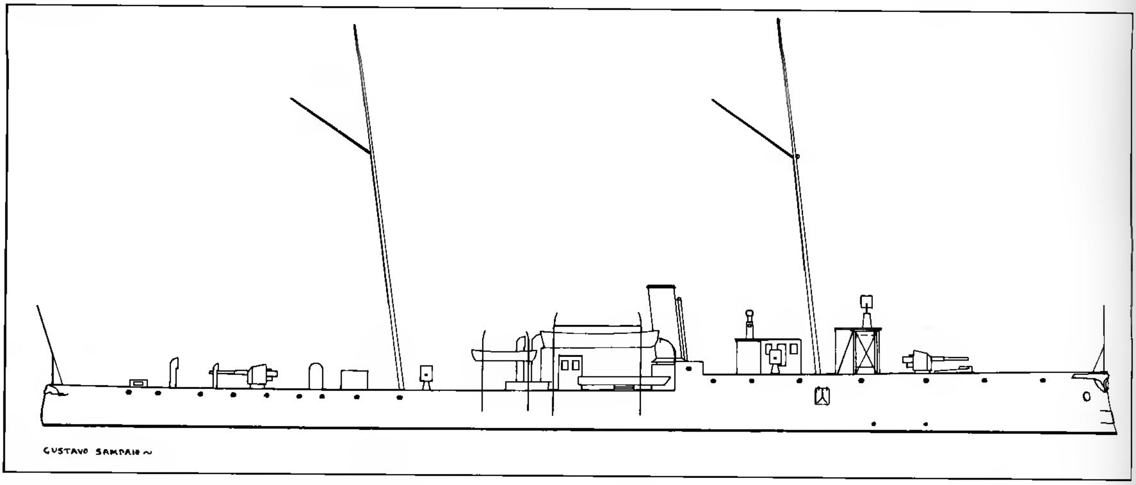


PLASSY alongside the bakery in Dockyard Creek, Malta, while on passage out to Bombay, 1891 Photo : WSPL

GUSTAVO SAMPAIO
ex AURORA ex BUENO VENTURA
Brazil

Yard & No	Laid down	Launched	Final Trials	Designer
Elswick 590	Not known Purchased Jul 1891	Relaunched 26 Jul 1892	Mar 1893	Not known

Displacement	408 tons. 465 tons on trial.
Dimensions	196 ft 9½ in (203 ft 1 in oa) x 20 x 7 ft 8 in [60.05 (62.01 oa) x 6.1 x 2.3]
Armament	2 x 3.5 in (20 pdr) QF, 4 x 3 pdr QF. 3 x 16 in Schwarzkopf TT, 1 fixed bow, 2 broadside training.
Machinery	2 sets VTE by Ernest Scott. 2 locomotive boilers. Designed IHP FD 2000 = 17 knots. Trials IHP FD 2180 = 16.761 knots.
Fuel	Coal. 150 tons. Radius 3000 miles at 10 knots.
Complement	60

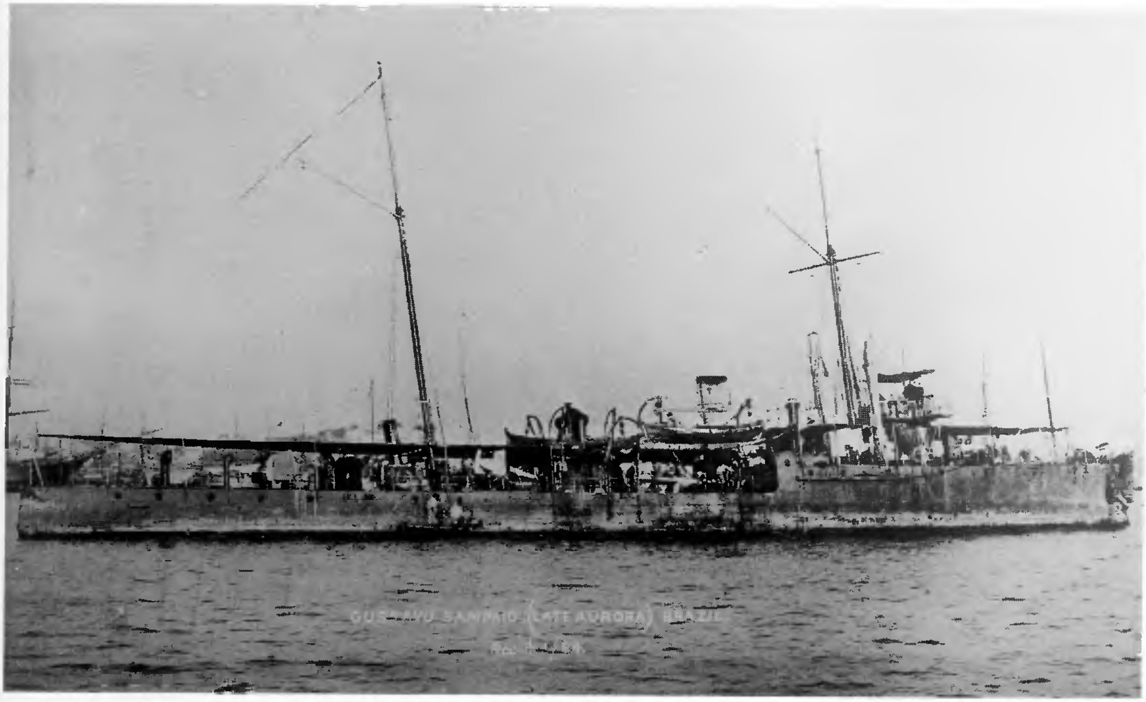


GUSTAVO SAMPAIO as finally completed by Armstrongs, 1893

General

The Elswick Yard report book for 22 July 1891 records that a vessel named BUENO VENTURA had been purchased. She had been completed in 1889 by "The Defence Vessel Construction Co", which had failed before the BUENO VENTURA was completed. No explanation is given as to why this ship was purchased. Could she have been going cheaply? She had been designed as a "torpedo boat destroyer" with a displacement of 400 tons. Armstrongs tried her on the measured mile on 28 July 1891, when she made 17 knots. She was then hauled up in order to rebuild her ends and upper works, particularly to add a forecastle which would give better accommodation for the crew, better protection for the magazines and shell rooms, and would also give a speed increase of 1-1½ knots. The work was completed on 24 May 1892 and she was christened AURORA when relaunched. There was no prospect of an immediate sale and trials and final fitting out proceeded at a leisurely pace. On 18 September 1892 there was an accident to the low pressure cylinder on the starboard engine (the engines had previously been described as well-built) which delayed sea trials until March 1893. She managed 18-18½ knots light and 17.9 knots with full bunkers. Speed on trials is given as 16.761 knots in the Particulars Book but this may relate to an earlier trial.

She was sold to the Brazilian government in October 1893, delivered to the loyalist base at Pernambuco by a steaming crew, taken over by the legitimate Brazilian government on 29 November and re-named GUSTAVO SAMPAIO. Her original name was probably given to her because she was launched by Señorita Aurora Dominguez, daughter of the Argentine ambassador, whose other daughter, Anita, had launched the NUEVE de JULIO on the same day.



GUSTAVO SAMPAIO early in 1894. From the apparently crumpled bow this may well be immediately after her collision with SILVADO in March. Photo : WSPL

Career

Brazil had been in a state of instability since the deposition of Emperor Pedro II in 1889. In September 1893 the naval units in the harbour of Rio de Janeiro pronounced against the legitimate government of Marshal Floriano Peixoto. The government, though it held most of the country, controlled few warships, and without more could do little against the insurgents, hence the purchase of the AURORA. Five Schichau torpedo boats were also added to the government forces. GUSTAVO SAMPAIO accidently rammed and sank one of these, the SILVADO, in March 1894.

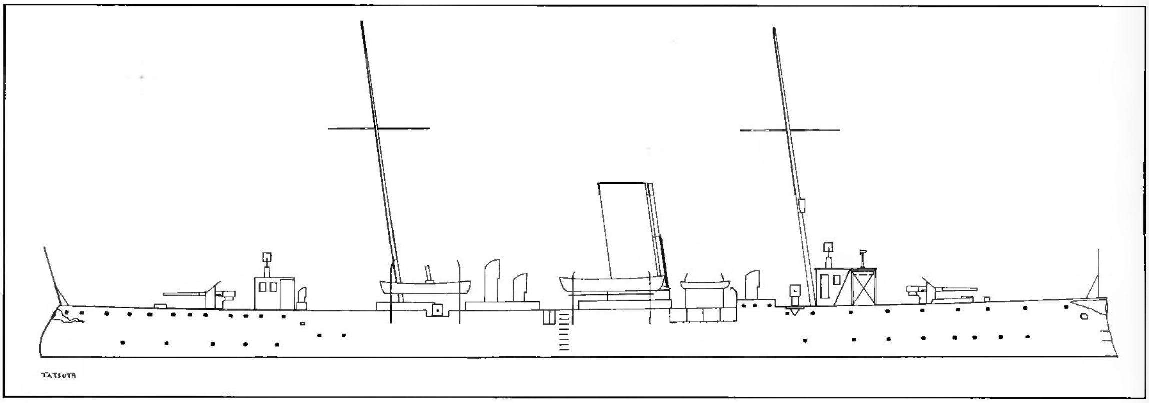
The insurgents were driven from Rio harbour in mid March 1894 and by the following month the rebellion had almost collapsed, most of the remaining resistance being centred on the 5000 ton battleship AQUIDABAN which had escaped southwards from Rio in February flying the flag of the insurgent leader Admiral de Mello. In April AQUIDABAN was in the Santa Catharina Straits. SAMPAIO under the command of First Lieutenant Fonseca Rodrigues, together with three torpedo boats, was detached from the main government squadron, anchored a few miles north of Santa Catharina Island, on 15 April. In the early hours of the following day SAMPAIO and two of the torpedo boats entered the bay. Initially they failed to spot the AQUIDABAN but she revealed her presence by opening a well-directed fire from her small guns. The SAMPAIO first launched a torpedo from her bow tube but this missed because of being fired too early; SAMPAIO was so close to her target that she had, briefly, to go astern. Passing slowly along AQUIDABAN's port side, a second torpedo was discharged from the starboard training tube at a range of 20 yards. This struck the battleship 30 feet from the bows, the 125 lbs of gun cotton in the warhead blowing a hole 20 feet long by 6½ feet wide and flooding the four forward compartments. AQUIDABAN was steamed into shoal water, sank on an even keel and abandoned. None of her crew were killed. Despite SAMPAIO being struck 35 times by 1 inch Nordenfelt shells she suffered no serious injury and only one crew member was injured.

In 1906 SAMPAIO became part of the Amazon flotilla and in 1910 was transferred to the Mato Grosso Flotilla. She was struck off the active list on 10 May 1942 after nearly 50 years in service.

TATSUTA
Japan

Yard & No	Laid down	Launched	Final Trials	Designer
Elswick 609	Jan 1893	6 Apr 1894	24 Jul 1894	Phillip Watts

Displacement	868 tons.
Dimensions	240 pp (253 ft 5 in oa) x 27 ft 6 in x 9 ft 6 in [73.15 pp (77.25 oa) x 8.38 x 2.89] Freeboard amidships 7 feet.
Armament	2 x 4.7 in QF, 4 x 3 pdr QF. 5 x 14 in TT, two twin, training: one fixed, bow.
Machinery	Two sets VTE by Hawthorn Leslie. Four cylindrical boilers. Contract IHP ND 4000 = 19.75 knots. No FD contracted for. Trials IHP ND 4700 = 20,5 knots. FD 5500 = 21.25 knots
Coal	75 tons normal, 228 tons maximum.
Complement	100



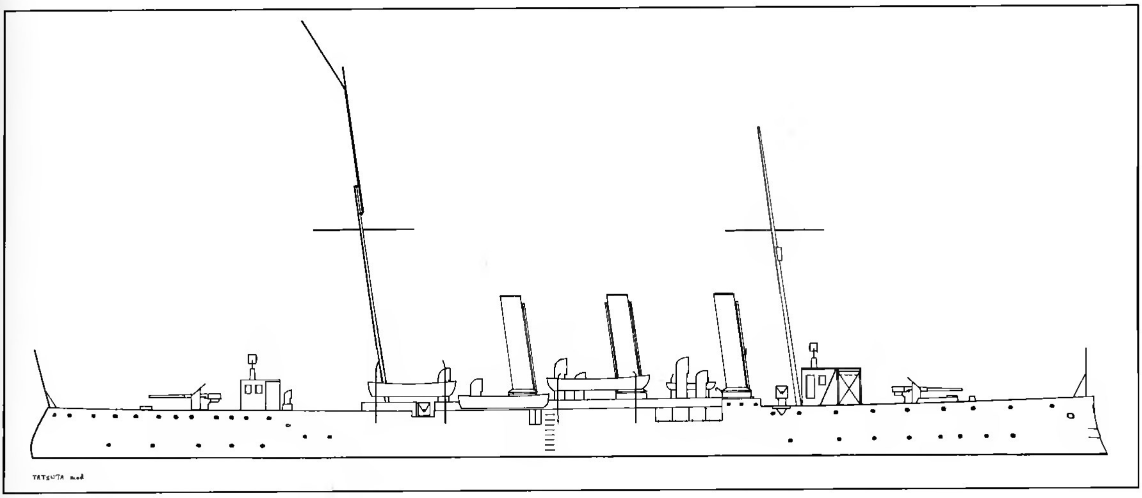
TATSUTA 1894

General

On 15 September 1892 Armstrongs' Minute Book records that the firm were in treaty with Japan for a "torpedo catcher" of about 850 tons and 21 knots speed but, for reasons not specified, not to be delivered until September 1894. On 24 July 1894 this vessel, named TATSUTA on launching, ran trials under normal draught which gave a speed of 20.5 knots, 0.75 knots over that contracted for. Armstrongs' agreed to provide a crew to take her to Japan and she departed the Tyne on 31 July 1894, two days before Japan formally declared war on China. She was detained by the British authorities at Aden in November 1894 but shortly afterwards the British government indicated that they were prepared to release her and hand her over to Japan. While in Aden she had successful steam trials on 28 March 1895 and was taken over by a Japanese crew. Although hostilities were not over, there is no record of TATSUTA having taken an active part in the war.

In form she resembled a small cruiser with high bulwarks between the raised poop and forecastle giving the appearance of an unbroken sheerline. The bulwarks hinged down to allow the training tubes to fire outboard. In 1903 the TATSUTA was re-boilered with Miyabara watertube boilers, with three slim funnels replacing the original single large one.

TATSUTA running trials off the Tyne before her delivery voyage Photo : NCL



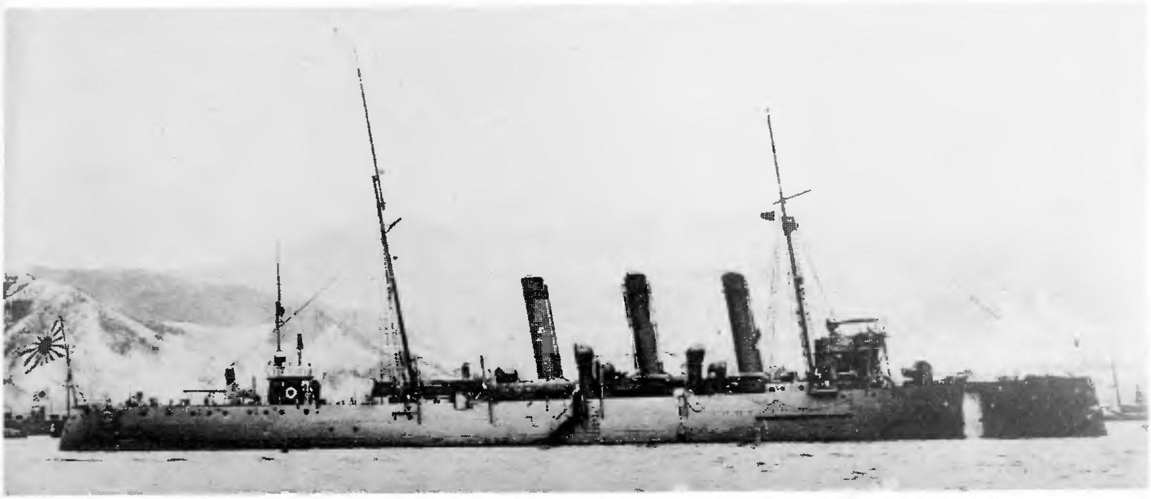
TATSUTA after reboilering, 1903

Career
She formed one of Admiral Togo's squadron off Taku during the Boxer rebellion of 1900. By the beginning of the Russo-Japanese War of 1904-05 TATSUTA was rated as a despatch vessel and in that capacity was in the First Division of the First Squadron, part of the Port Arthur blockading force.

On 15 May, three months after the outbreak of war, the Japanese battleships YASHIMA and HATSUSE (the latter flying the flag of Rear Admiral Nashiba), were lost to mines ten miles outside Port Arthur. Nashiba transferred his flag to TATSUTA but that evening she ran into fog and went ashore on Kuan Lun Tao the westernmost of the Elliot Islands. She remained there for a month before being refloated and repaired at Yokosuka. Repairs were completed by the end of August and she rejoined the fleet in September; in November she captured a German steamer the VETERAN bound for Port Arthur from Shanghai.

At the Battle of Tsushima, 27-28 May 1905, TATSUTA was despatch vessel to Togo's First Squadron. At the end of the first day's fighting Admiral Togo "ordered the TATSUTA to carry orders to the entire fleet that it would proceed northward and rendezvous on the following morning at the Ulneung (Ullondo) Islands".

In 1905 the 47 mm (3 pdrs) were replaced by 3 in QF and 18 in torpedo tubes substituted for the original 14 in. She became a submarine depot and repair ship in 1918, being renamed NAGAURA (MARU), her original name being given to a new light cruiser. She was struck off the list in 1925 and broken up.

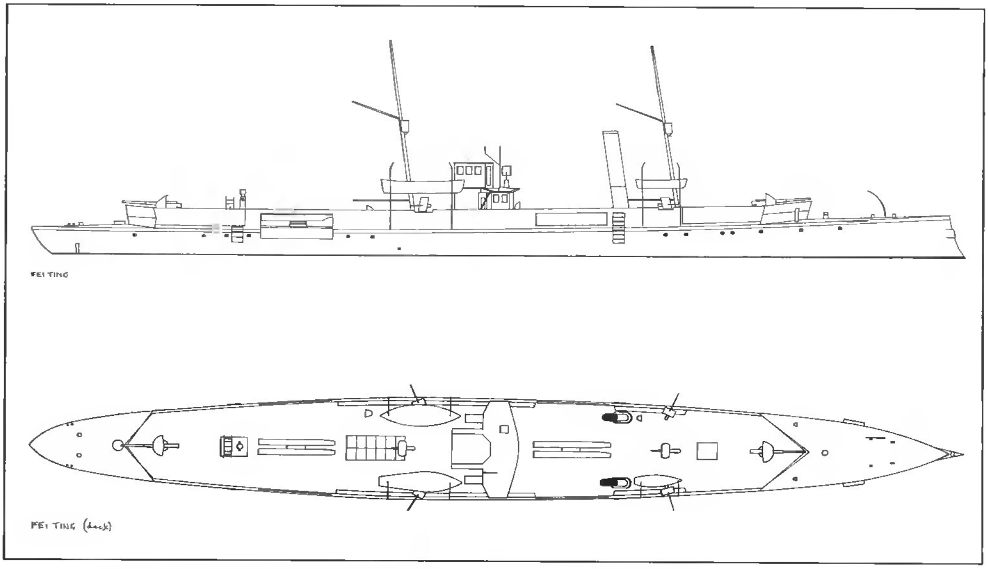


TATSUTA in 1906, after the end of the Russo-Japanese War, with three funnels and with a tall topmast and w/t gaff on her mainmast.
Photo : WSPL

FEI TING
ex SEA SERPENT
China

Yard & No	Purchase Date	Modifications Complete	Left Tyne
Built Falcon Yard Cowes (J S White) No 746. 1887-88. Elswick 621.	Mar 1894	Sep 1894	23 Jun 1895

Displacement		401 tons with 90 tons of coal.
Dimensions	White	200 (208 ft 9 in oa 199 ft 4 in wl) x 23 x 6
	Elswick	197 ft 7 in (208 ft 9 in oa) x 23 ft 7½ in x 8 [60.23 (63.63 oa) x 7.21 x 2.42]
Armament		2 x 3.75 in (25 pdr) QF, 4 x 3 pdr QF
		5 x 14 in TT, two twin training broadside, single fixed bow.
Machinery		Belliss & Co 2 sets triple expansion. Locomotive boilers.
		Designed IHP ND 2000 = 18 knots, FD 3000 = 20 knots.
		1890 Trials IHP ND 1695.2 = 18.66 knots, FD 2932 = 21.45 knots. (50 tons coal)
Coal		50 tons normal, 90 tons maximum.
Complement		92



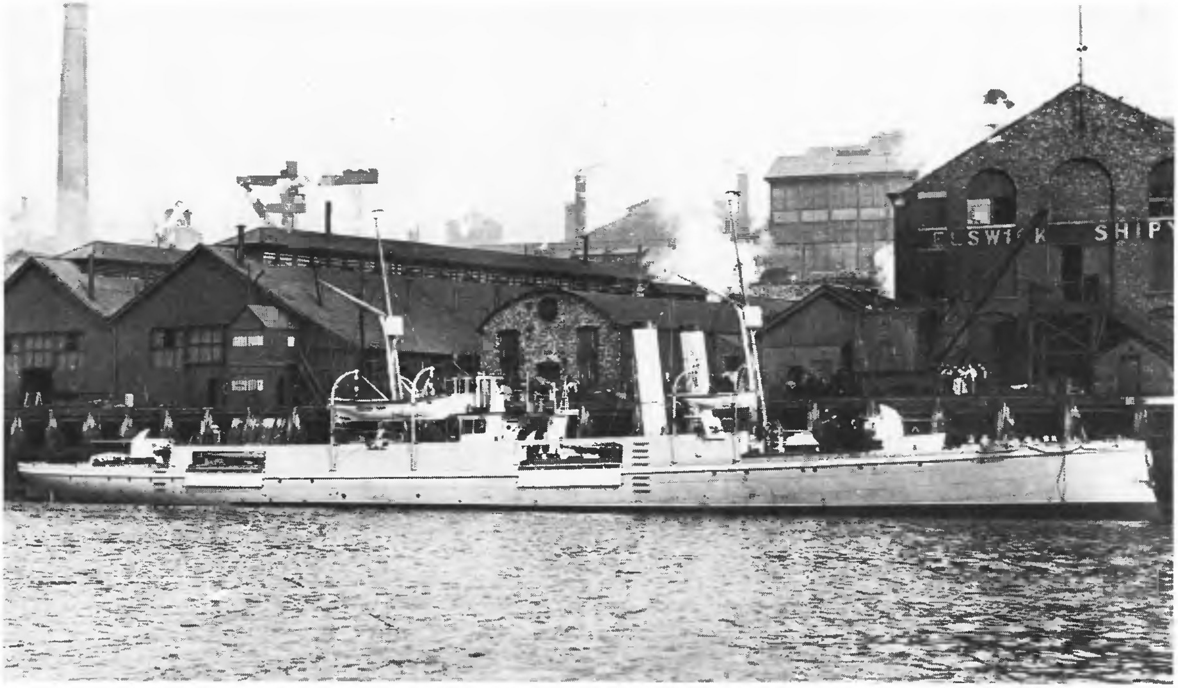
FEI TING as finally completed for China, 1895

General

Armstrongs' Minute Books record that on 21 March 1894 they 'purchased a vessel of the torpedo boat destroyer type which was built a few years ago by Mr J S White at Cowes and engined by Messrs Belliss and Co 200 ft long and speed 20 plus knots'. No reason is given as to why Armstrongs' again went into the second hand market.

This ship was first reported on by the USN's Office of Naval Intelligence in 1888, when it recorded that 'White of Cowes is building an experimental twin screw seagoing torpedo catcher on his turnabout plan. The general dimensions are length 200 feet, displacement 300 tons, minimum speed 22 knots when fully loaded'.

Elswick modified her by generally strengthening her, fitting bulwarks, and installing a powerful gun and torpedo armament. This resulted in a 7½ in increase in beam and 2 ft increase in draught. On 6 August 1894, just before the outbreak of the Sino-Japanese War, she was sold to Mr John Palmer Jr, who was acting as an agent for the Chinese government; on 13 September she was detained by the Board of Customs. She lay in the Tyne until 23 June 1895, two months after the end of the war, with Armstrongs contracting to supply a steaming crew to take her to Tientsin.



FEI TING alongside at Elswick before departure for China, with the hinged bulwarks in way of her twin training TT lowered.
Photo : Vickers

FEI TING's appearance was quite unlike the conventional TGB and indeed resembled no other warship, with the exception, in its original form, of another White vessel, TB 81, being flush decked with marked sheer forward, a canoe stern, two slender funnels side by side and a quite substantial bridge amidships. Hinged bulwarks which ran between the two 3.75 in guns were fitted, one of the Armstrong modifications designed to make her more seaworthy; this would of course be especially necessary for the long sea voyage to China.

Career

During the Boxer uprising in 1900 she was in dry dock in Taku. Both yard and boat were captured on 17 June by Lieutenant Roger (later Admiral of the Fleet, Lord) Keyes, who, shortly before, had seized four Chinese destroyers. Keyes could not spare men to guard the yard and was reluctant to hoist a white ensign in case it should be removed by the Chinese; when he returned later he found to his mixture of amusement and fury that the Russians had taken over possession. The Russians remained in the yard until August 1902 when it, and the FEI TING, were returned to the Chinese; pieces of her machinery such as gauges and valves had been removed in order to repair Russian ships.

FEI TING was non-operational until 1907 when she entered dock at Taku, but because she sustained damage due to a dock accident her repairs were delayed and she was not recommissioned until July 1909. She took some part in the revolution of 1911 and the civil war that followed, being mentioned as in action in 1913, but by the end of the revolution in 1920 her name had disappeared from the Navy list.

DESTROYERS

In 1892 Alfred Yarrow, a specialist torpedo boat builder, in collaboration with Rear Admiral J A Fisher (later Admiral of the Fleet Lord Fisher), then Controller of the Navy, and W H White, developed the first successful counter to the torpedo boat by building the first of the 27 knot torpedo boat destroyers. HAVOCK was the first of six prototypes built by the three major torpedo boat builders, Yarrow, Thornycrofts and Lairds. The Admiralty laid down the broad specifications and the individual builders produced their own detailed designs. To achieve the contract speed with reciprocating engines in a small light hull called for great expertise and experience and the attempt was an important contributory factor for one non-specialised firm going bankrupt, while the performance of Armstrongs 27 knotters was so poor that the DNC recommended that Armstrongs be not invited to tender for 30 knotters.

Destroyers were larger and more seaworthy than torpedo boats but were still so uncomforable that the crews received "hard lying money" as compensation for the conditions on board at sea. They were armed with one 12 pdr, three to five 6 pdrs and two training 18 in torpedo tubes. The first six also had a single bow tube but the protective cap sprayed water back on the bridge and thereafter this tube was omitted.

Armstrongs built two 27 knotters, SWORDFISH and SPITFIRE, for the Admiralty but had difficulty in achieving the designed speed with both. They followed these with two very different boats built as speculations. One was a conventional copy of the 30 knot Admiralty design which was eventually sold to Chile as the CAPITAN THOMPSON; the other was the turbine engined COBRA. Finally the AFRIDI was built as one of Fisher's ocean-going TBD, the Tribal class.

SWORDFISH SPITFIRE

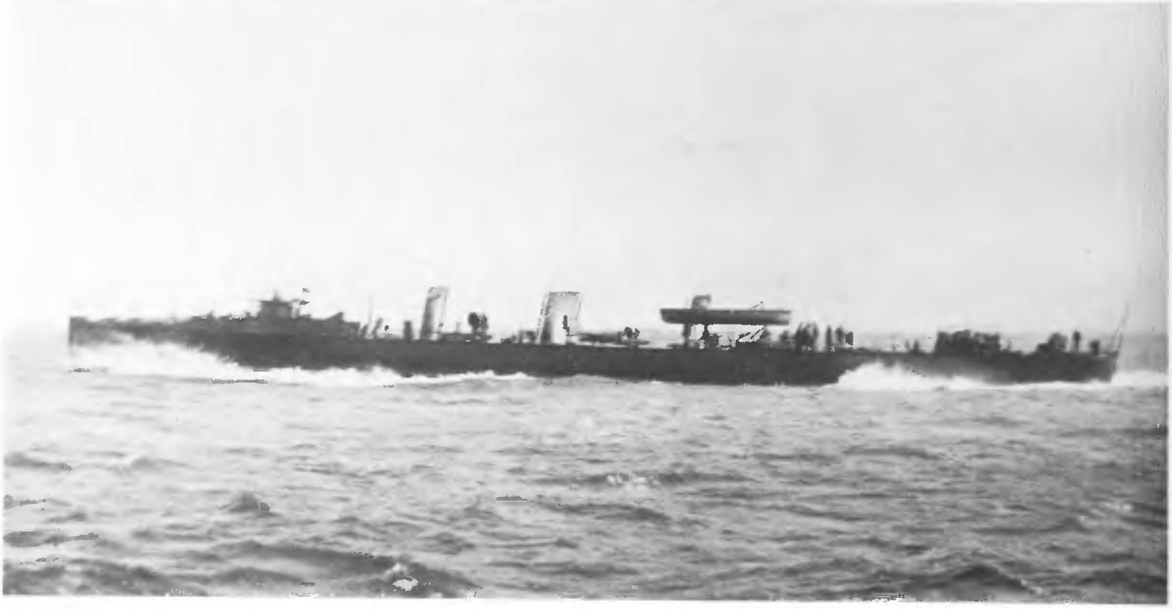
Great Britain

Yard & No	Laid down	Launched	Final Trials	Dasigner
SWORDFISH				
Elswick 616	4 Jun 1894	27 Feb 1895	21 Oct 1896	Phillip Watts
SPITFIRE				
Elswick 618	5 Jun 1894	7 Jun 1895	17 Aug 1896	Phillip Watts

Displacement	280 tons on trial.
Dimensions	200 ft 1 in x 19 x 5 ft 3$\frac{3}{8}$ in [60.98 x 5.79 x1.62]
Armament	1 x 12 pdr QF, 5 x 6 pdr QF. 2 x 18 in TT in single tubes.
Machinery	2 sets VTE by G E Belliss, 8 Yarrow water tube boilers. Designed IHP FD 4000 = 27 knots. Trials (SPITFIRE) IHP FD 4527 = 27.461 knots.
Fuel	Coal. 30 tons normal. 62 tons maximum.
Complement	50

General

In September 1893 Armstrongs' were asked to tender for one, two or three 27 knot TBDs. In November they were told that their first designs were unsatisfactory and that modifications would need to be made: all of these, with two or three exceptions, were acceptable and new drawings were forwarded. In January 1894 an order for a TBD named SWORDFISH was made and quotations were invited for second and third vessels. In March, the Admiralty, impressed by HORNET's successful trials, asked for boilers and machinery similar to hers to be fitted to SWORDFISH; Belliss and Co were asked to supply these. At the same time an order was made for a second boat, SPITFIRE, which was to have the same machinery. There were delays because of a moulders strike, but



SPITFIRE running trials off the Tyne, not yet armed or fully equipped, 1896 Photo : Vickers Archive, CUL

SWORDFISH was launched in February and trials were run three weeks later; at the end of these the starboard propeller shaft was found to be bent. After straightening further trials were run in July, but again, the shafting was bent. The excessive vibration which had caused this trouble necessitated balancing the engines and preliminary trials in March 1896 were satisfactory with no vibration, but when trials were run again she made less than 27 knots because of a foul bottom. SPITFIRE achieved 27.25 knots with satisfactory final trials; both boats were taken over in November 1896. All the 27 knotters could make their speed only in ideal conditions, with clean bottoms and picked coal; by 1904 speeds had fallen considerably. By 1909 full power trials showed that most of them were good for 20 - 23 knots only.

Careers

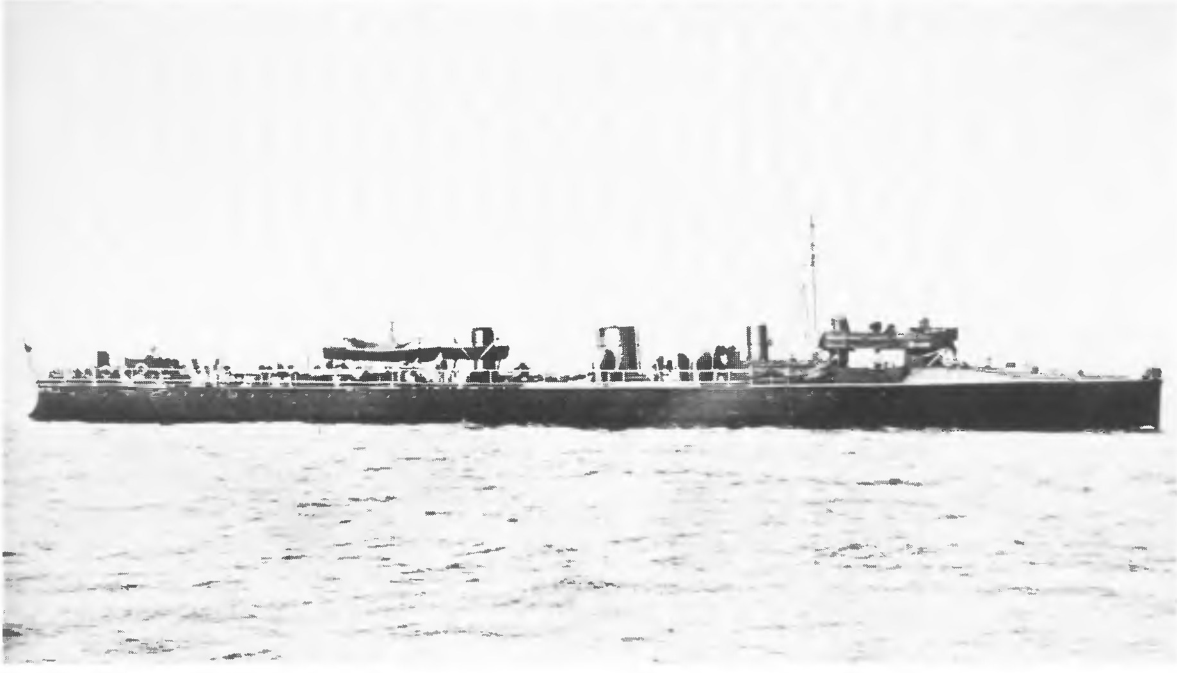
SPITFIRE
Based at Chatham, Sheerness and Portsmouth, serving at times as tender to PEMBROKE, WILDFIRE and LEANDER. Sold 10 April 1912 to Wards of Preston.

SWORDFISH
Based at Chatham, Sheerness and Portsmouth, serving at times as tender to PEMBROKE and WILDFIRE. By 1909 her maximum speed had fallen to 18½ knots. Sold 11 October 1910 to Cashmores of Newport.

CAPITAN THOMPSON
Chile

Yard & No	Laid down	Launched	Final trials	Designer
Elswick 673	12 Jan 1898	6 May 1899	15 Mar 1902	Phillip Watts

Displacement	348 tons.
Dimensions	223 ft 6 in x 20 ft 6 in x 5 ft $6\frac{3}{8}$ in [68 x 6.2 x 1.69] Freeboard amidships 8 ft.
Armament	1 x 12 pdr QF, 5 x 6 pdr QF. 2 x 18 in TT in single mounts.
Machinery	2 sets VTE by Wallsend Slipway & Engineering Co. 4 Yarrow watertube boilers. Designed IHP FD 6500 = 30 knots.
Fuel	Coal. 45 tons normal, 101.9 tons maximum.
Complement	63



CAPITAN THOMPSON as completed, 1902 Photo : Vickers

General

Laid down in March 1898 as a stock vessel similar to the Royal Navy's 30 knot destroyer type, authorisation having been given in late 1897. She ran preliminary trials in June 1899 and again ran trials in January 1900 when a crack was found in the starboard intermediate cylinders; a new casting was needed. In April 1900 she made 29.18 knots for a short time, but with too few stokers and a poor vacuum: it was decided to fit new propellers. She again ran trials in September 1900 but there was a "mishap giving the destruction of a number of tubes in two boilers", and she was then retubed. In April 1901 she ran further trials reaching 30.3 knots but a belt fan of one of the engines broke down, so that a more extended trial could not take She was sold to Chile in December 1901 or January 1902 and had her last set of trials on 15 March 1902, achieving 29.68 knots; the Chilean officials declared their satisfaction with this. She left the Tyne on 29 April 1902 giving trouble to the last because of leaky condenser tubes.

Career

She was stricken in 1924 after uneventful service.

COBRA

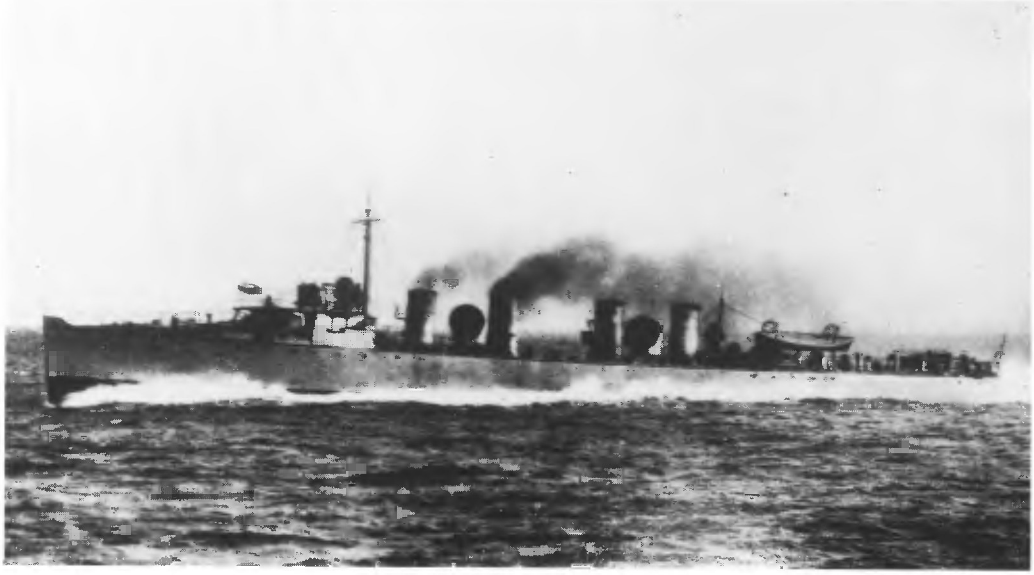
Great Britain

Yard & No	Laid down	Launched	Final trials	Designer
Elswick 674	27 May 1898	28 Jun 1899	21 Aug 1900	Phillip Watts

Displacement	354 tons. 425 tons on trials with 40 tons coal.
Dimensions	223 ft 6 in x 20 ft 6 in x 5 ft 6 3/8 in [68 x 6.1 x 1.69]
Armament	1 x 12 pdr QF, 5 x 6 pdr QF. 2 x 18 in TT in single tubes.
Machinery	4 shaft Parsons Turbines by Parsons Marine Steam Turbine Co. 4 Yarrow water tube boilers. Trials SHP FD 11,500 = 34.88 knots on 6 runs on measured trials. 34.574 knots for 3 hours.
Fuel	Coal. 107 tons maximum.
Complement	63

General

She was laid down as a stock ship in March 1898 being designed from the outset to have Parsons turbines. In August 1899 shortly after launching she was run into by a collier when moored and this delayed trials. She ran her first trials in September 1899 reaching 32 knots. She was offered to the Admiralty in December 1899 and in



One of the few photographs in existence of COBRA during her short career, showing her at speed while running trials.
Photo : MPL

the following February the hull was surveyed in dry dock by W T Pine, Assistant Constructor, who found the shell plating up to the load waterline covered with a thin layer of magnetic rivet cement with antifouling composition over. The cement was breaking away in places and the plates revealed were rusty with the galvanising having quite gone. The fore and after plates forming the middle line boiler bearers did not extend to the shell plating. These plates were somewhat buckled and out of shape under all the boilers and required stiffening; and the scantlings generally were lighter than those in VIPER being similar to those in SWORDFISH and SPITFIRE although their machinery and boilers weighed only 115 tons against 183 in No 674. This was actually 23 tons more than the maximum estimated at the design stage; the 27 knotters were 23 ft 6 in shorter in length. The Armstrong boat was 13 ft 3 in longer than VIPER and 6 in less in beam.

The Admiralty officials considered that she would not be as satisfactory as those TBDs which had been entirely designed and built under Admiralty inspection. Instructions were given for stiffeners to be added and, after prolonged negotiations, the destroyer was purchased for £63,500 and named COBRA. A speed of 34 knots was guaranteed with penalties if this was not attained. On 25 July she had successful trials reaching 34.7 knots over a three hour trial; the Admiralty officials estimated her speed was 34.3 knots.

On 17 September 1901 she left Elswick en route for Portsmouth to be armed. Bad weather was met off Flamborough Head and in the early morning of the 18th she broke in two with only twelve survivors of the 79 on board, 24 of whom were employees of Armstrongs or Parsons. The subsequent Court Martial found that she had foundered because of her structural weakness. The Court also found that she was weaker than other destroyers "and in view of that fact it is to be regretted that she was purchased into His Majesty's service".

Subsequent experiments were made on a similar destroyer, HMS WOLF, which was subjected to very severe strains while in dry dock; no structural damage was sustained. The investigating committee found that COBRA was not subjected to such severe testing as WOLF, and that there was no reason to suppose that the hull would have broken if the structure had been free of flaws and properly constructed. However the seas COBRA encountered were not extreme and Phillip Watts suggested that the keel had been buckled and flooding caused by the ship hitting some semi-submerged wreckage, a view which a distinguished modern architect believes has some validity.

AFRIDI

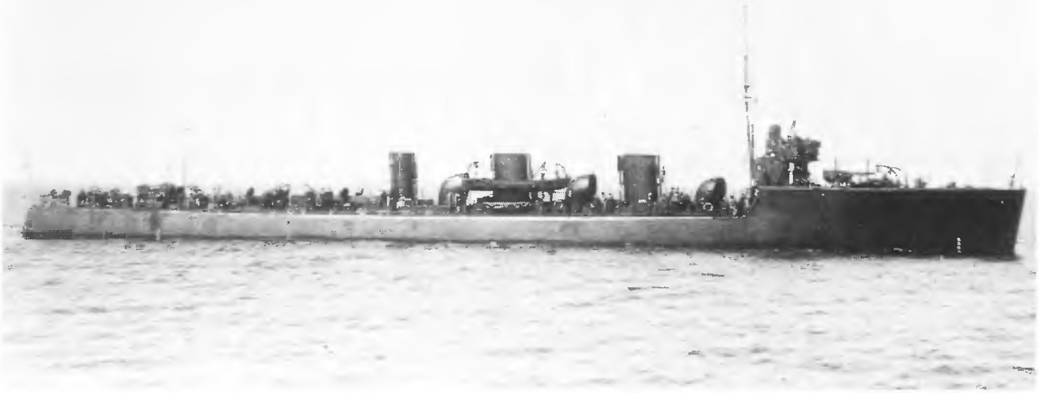
Great Britain

Yard & No	Laid down	Launched	Final Trials	Designer
Elswick 777	10 Aug 1906	8 May 1907	8 Sep 1908	J R Perrett

Displacement	833 tons.
Dimensions	250 (259 ft 3 1/4 in oa) x 25 x 7 ft 6 in [76.2 (79.03 oa) x 7.62 x 2.29]
Armament	3 x 12 pdr12 cwt QF (2 x 12 pdr QF added 1909). 2 x 18 in TT in single mounts.
Machinery	3 shaft turbines by Parsons Marine Steam Turbine Co. 5 Yarrow water tube boilers. Designed SHP FD 14,250 = 33 knots.
Fuel	Oil. 188 tons.
Complement	65

General

Less than a month after his taking office as First Sea Lord, Admiral Sir John Fisher called for a revolutionary destroyer design. The new class was to be oil fired, to have Parsons turbines, and to steam at 33 knots. Their predecessors, the River class, had been coal fired, only one had turbines and their speeds were 25.5 knots. The firms tendering had exactly eleven days to submit their designs. Because of their names (COSSACK, GHURKA etc) they were collectively known as the Tribal class but later as the "F" Class. They were not built from Admiralty designs so that they varied greatly in size, (the AFRIDI was the shortest) displacement ranging from TARTAR's 850 tons to VIKING's 1090 tons and in appearance, with three to six funnels. The AFRIDI had three, the forward two somewhat wider than the after one.



AFRIDI at sea during trials. Note that she is not flying an ensign. Photo : NCL

Although AFRIDI was ordered in September 1905, her keel was not laid down for 11 months because of delays by the Admiralty in approving drawings, but this would seem to have been the case with all five boats of the 1905-06 programme. After launching, her turbines were installed at Parsons' works, down river at Wallsend. Preliminary trials in September 1907 demonstrated the need for the propellers to be changed, and more changes were made in November. The weather was so bad on the North East Coast that winter that eventually trials were run on the Maplin course near Sheerness, but these were unsatisfactory and AFRIDI had to return to Elswick. She went down to Sheerness again but lay idle for months, initially because of bad weather and then because of an engineering strike. Eventually she was tried in October 1908 but had once more to return to Elswick so that the propellers and turbines could be examined. She again ran trials on the Maplin course in February 1909 and achieved 33.25 knots, but was sent up to Elswick for rough weather trials: these were satisfactory and she was accepted for the Royal Navy on 10 September 1909, four years after being ordered and 26 months later than the contract date. AFRIDI was the last destroyer to be built by Armstrongs.

Career

After being accepted the armament was supplemented by two extra 12 pdr, 12 cwt guns. For the whole of World War One AFRIDI was a unit of the Sixth Flotilla based at Dover: the poor endurance of all the Tribals prevented them from working from any other base. In 1916, because German destroyers were armed with 4.1 in guns, the Tribals were rearmed in different ways, AFRIDI having two 4.7 in, one pompom, one maxim, 4 depth charges and two throwers. She was sold on 9 December 1919 to F Wilkinson for scrapping.

SUBMARINES

Unlike their unfortunate excursions into destroyer building, Armstrongs record in the field of submarine construction was on the whole a successful one.

By 1897 the Irish-American inventor John P Holland had produced the first practical and viable type of submarine boat. In the following year the Electric Boat Company swallowed up Holland's firm and in 1900 Vickers were granted a 25 year licence to build Electric Boat Co designs in Britain, the Empire and Europe. Two years later Vickers were in effect given a commercial monopoly to provide all contract built RN submarines.

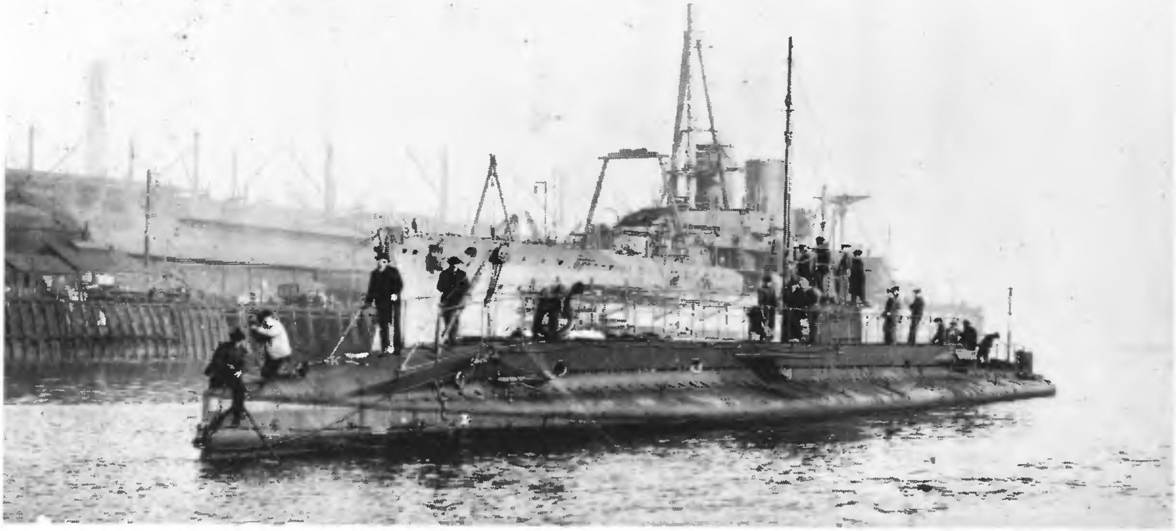
In 1910 Roger (later Admiral of the Fleet, Lord) Keyes was appointed Inspecting Captain of Submarines and quickly determined to break Vickers' monopoly, partly so that he could go elsewhere, including abroad, for better designs, and partly because Vickers was nearly a year late with deliveries on their current orders. Two years' notice at the end of a financial year had to be given, so that it was not until April 1913 that orders could be placed with other firms, notably Armstrongs' and Scotts of Greenock. The four Armstrong boats, W1 - 4, were based on a design by Maxim Laubeuf, produced for the Greek navy for service in the Mediterranean. A small committee of officers representing the DNC, the Engineer in Chief and Keyes' principal assistant inspected the two Greek boats at Schneider's yard at Chalons but did not recommend the type; nevertheless the Admiralty wanted to provide work for Armstrongs' as soon as possible after the Vickers monopoly ended and two boats were ordered in the 1912-13 estimates, and a further pair in the 1913-1914 estimates.

W1, W2, W3, W4

Great Britain

Yard & No	Laid down	Launched	Completed	Designer
W1				
Elswick 863	8 Sep 1913	19 Nov 1914	6 Jan 1915	Maxim Laubeuf
W2				
Elswick 864	5 Sep 1913	15 Apr 1915	18 May 1915	Maxim Laubeuf
W3				
Elswick 865	7 Nov 1914	25 Jul 1915	4 Feb 1916	Maxim Laubeuf
W4				
Elswick 871	20 Mar 1914	11 Sep 1915	27 Jun 1916	Maxim Laubeuf

Displacement	W1 & 2 333/494 tons. W3 & 4 324/496 tons.
Dimensions	W1 & 2 172 ft pp and oa x 15 ft 6 in x 7 ft 2 in forward, 7 ft 5 in aft [52.5. x 4.7 x 2.18]. W3 & 4 149 ft 11 in pp and oa x 17 ft x 7 ft 5 in forward, 8 ft aft [45.7 x 5.2 x 2.44].
Armament	2 x 18 in bow TT (W1 & 2 : 2 - 18 in Drzwiecki drop collars in addition) 1 x 76 mm AA.
Machinery	2 sets 8 cylinder Lambert-Schneider diesels. W1 & 2 each set 355 BHP, W3 & 4 380 BHP each. Electric motors 240 HP submerged. Designed speed 13/8 knots.
Endurance	Surface 880 miles at 11 ½ knots.



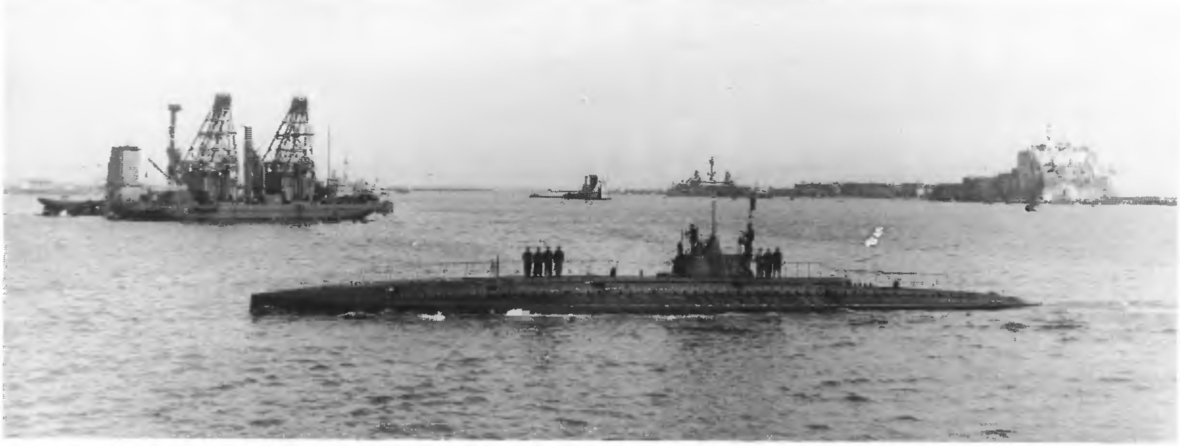
W 2 on trials off Elswick, with CANADA fitting out in the background, early in 1915 Photo : NMM C3310

General

Armstrongs entered into negotiations with Schneiders in July 1912, presumably to build submarines under licence. with the contract settled by September 1912. Plans were submitted to the Admiralty on 28 February 1913 and after conference with Admiralty officials in July 1913, agreement was reached to build W1 and W2. As predicted the Schneider boats were unsatisfactory, although much of their poor performance was due to their diesel engines.

Careers

After launching they were completed at High Walker. W1 and W2 served with the 10th Flotilla based on the Humber. All were transferred to Italy in August 1916 (W4 was never commissioned into the RN) after the poor performances of the machinery of the first three resulted in their being inactive for much of the time. These problems continued in Italian service, with the diesels giving trouble and the boats being difficult to manoeuvre. Only W3 and W4 carried out operations; W4 was lost, probably mined, on 4 August 1917. The remainder were struck off the Navy list 14 September 1919 for scrapping.



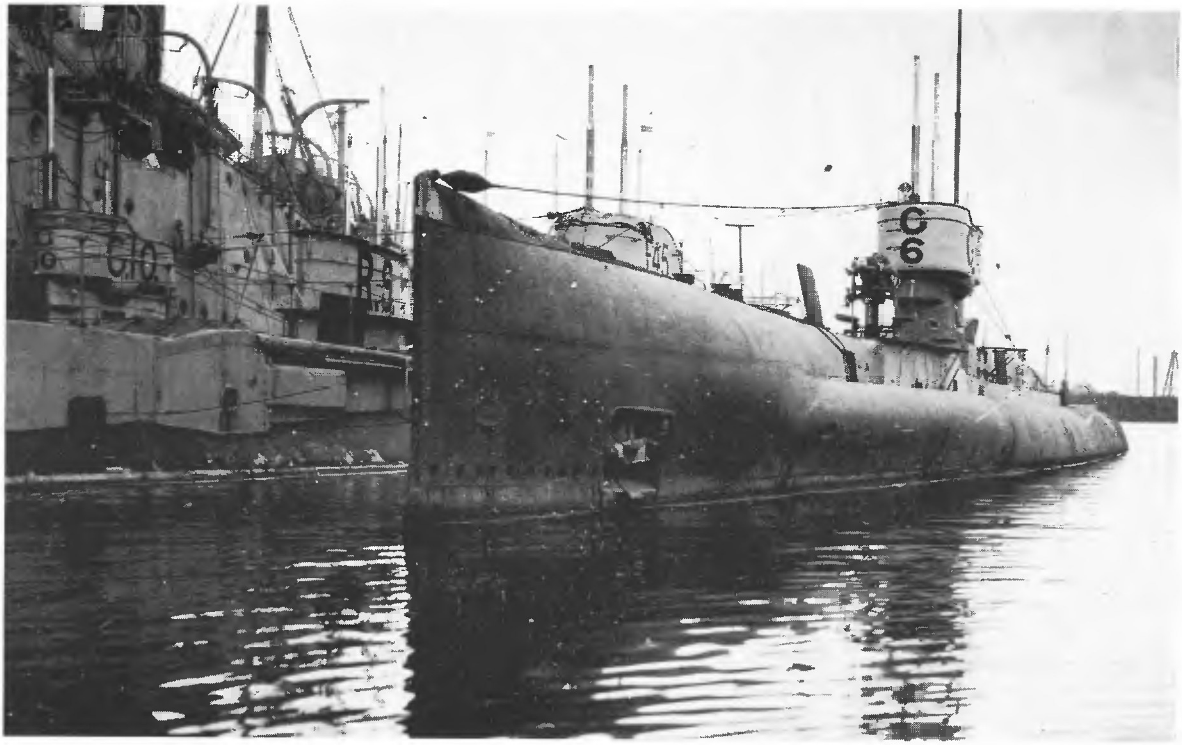
W 3 under Italian colours at Brindisi, 3 November 1917. In the background is the salvage ship ANTEO working on the wreck of the battleship BENEDETTO BRIN, with beyond her the old battleships DANDOLO and ANDREA DORIA. Photo : IWM Q48316

G6 G7

Great Britain

Yard & No	Laid down	Launched	Completed	Designer
G6				
Elswick 880	8 Dec 1914	7 Dec 1915	7 May 1916	DNC (Modified Laurenti design)
G7				
Elswick 881	8 Dec 1914	4 Mar 1916	19 Aug 1916	DNC (Modified Laurenti design)

Displacement	700/975 designed. 693/964 as completed.
Dimensions	185 (187 oa) x 22 ft 8 in x 13 ft 3 in [56.4 (57 oa) x 6.9 x 4.0]
Armament	1 x 21 in TT stern, 2 x 18 in TT bow, 2 x 18 in TT broadside. 1 x 12 pdr QF, 1 x 2 pdr QF.
Machinery	Two sets diesel engines and electric motors 1600/840 BHP = 14.5/10 knots.
Fuel	44 tons oil; range 2,400 miles at 12 knots on surface.



G 6 at Blyth in 1918, with G 10 and R 9.

Photo : IWM Q64673

General

In late 1913 the Admiralty made a decision to design two types of submarine, coastal and overseas, the latter being double hulled and with a large measure of buoyancy (a type then described as a submersible) and with good seakeeping qualities surfaced. The aim was to have higher speed than the E class but this was not realised in practice. Seven boats were laid down under the 1914 Estimates and eight under Fisher's war expansion programme of November 1914. The Armstrong pair, part of the first order, were launched at Elswick and completed at High Walker. Described at the time as E class submarines, they were ordered in July 1914.

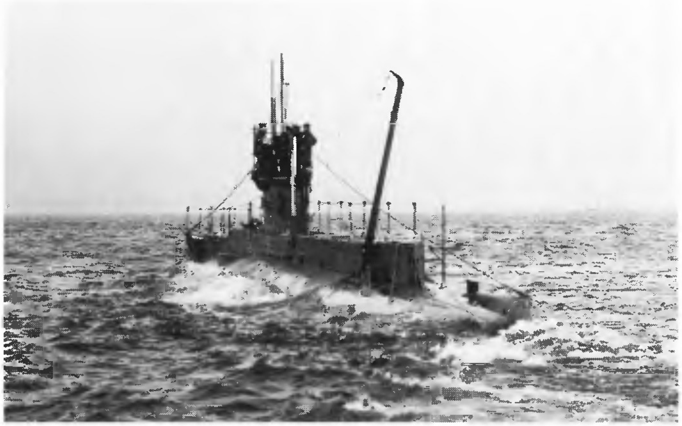
Careers

G6 served in the 11th submarine Flotilla based at Blyth and war service included a spell in the Arctic. Sold 4 November 1921 to Young, Sunderland. G7 was in the 10th Flotilla on the Tees. G7 was the last British submarine to be lost by enemy action during the Great War, failing to return from a North Sea patrol at the beginning of November 1918.

E29 E30
Great Britain

Yard & No	Laid down	Launched	Completed	Designer
E29				
Elswick 884	4 Dec 1914	1 Jun 1915	13 Oct 1915	DNC
E30				
Elswick 885	8 Dec 1914	29 Jun 1915	8 Dec 1915	DNC

Displacement	662/807 designed. 666 tons surface actual.
Dimensions	176 (181 ft 3 in oa) x 22 ft 6 in x 12 [53.6 (55.2 oa) x 6.9 x 3.7]
Armament	5 x 18 in TT, 2 bow, 2 broadside, 1 stern. 1 x 12 pdr QF, 1 x 2 pdr QF HA.
Machinery	2 sets diesel and electric motors. 1600/840 BHP = 15.25/9.75 knots.
Fuel	45/50 tons oil. 3225/85 miles at 10/5 knots.



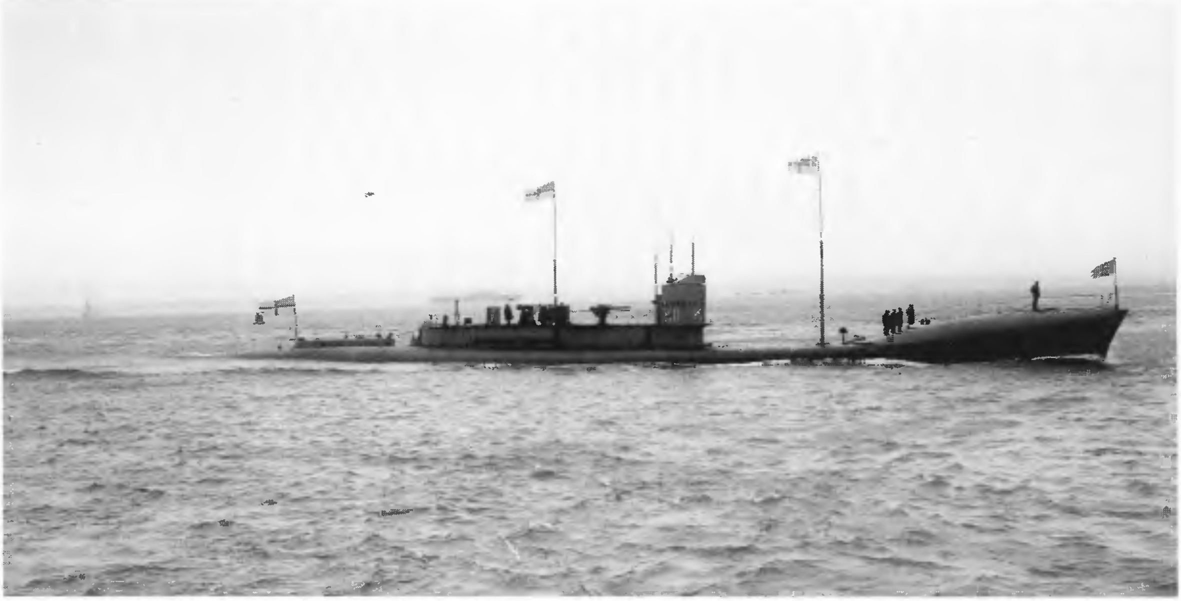
E 30 on completion, late 1915 Photo : NMM P39082

General

Saddle tank, "overseas" submarines of a well-tried type. Laid down under the 1914 Emergency Estimates following a conference at the Admiralty on 3 November 1914. After launching they were towed down-river and completed at High Walker.

Careers

Both probably based at Harwich. E30 was lost from unknown causes in the North Sea on 22 November 1916. E29 survived the war and was sold 21 February 1922 to Upnor Shipbreaking Co.



K 11 with the bulbous forecastle fitted in 1920 in an attempt to cure her diving propensities, and with augmented peace-time masting. Photo : NMM DHD1

K11 K12 K23 K24 K25

Great Britain

Yard & No	Laid down	Launched	Completed
K11			
Elswick 902	18 Oct 1915	16 Aug 1916	24 Feb 1917
K12			
Elswick 903	21 Oct 1915	23 Feb 1917	Sep 1917
(both completed at High Walker)			
K23			
High Walker 958	13 Mar 1919)		
K24	)		
High Walker 959	)	Cancelled	
K25	)		
High Walker 960	)		

Displacement	1883/2565 tons.
Dimensions	334 (339 oa) x 26 ft 6 in x 17 ft forward, 18 ft aft. [101.8 (103.3) x 8.1 x 5.5]
Armament	10 x 18 in TT, 4 bow. 4 beam, 2 in casing. 2 x 4 in QF, 1 x 3 in AA
Machinery	2 sets geared steam turbines by Wallsend Slipway & Engineering Co for surface: electric motor submerged. 2 Yarrow boilers.10,500 SHP/1440 HP = 23.5/9.5 knots.
Fuel	Oil 200 tons normal. 300 tons maximum. Endurance : 3000 miles at 13.5 knots surfaced, 50 miles at 4 knots submerged.

General

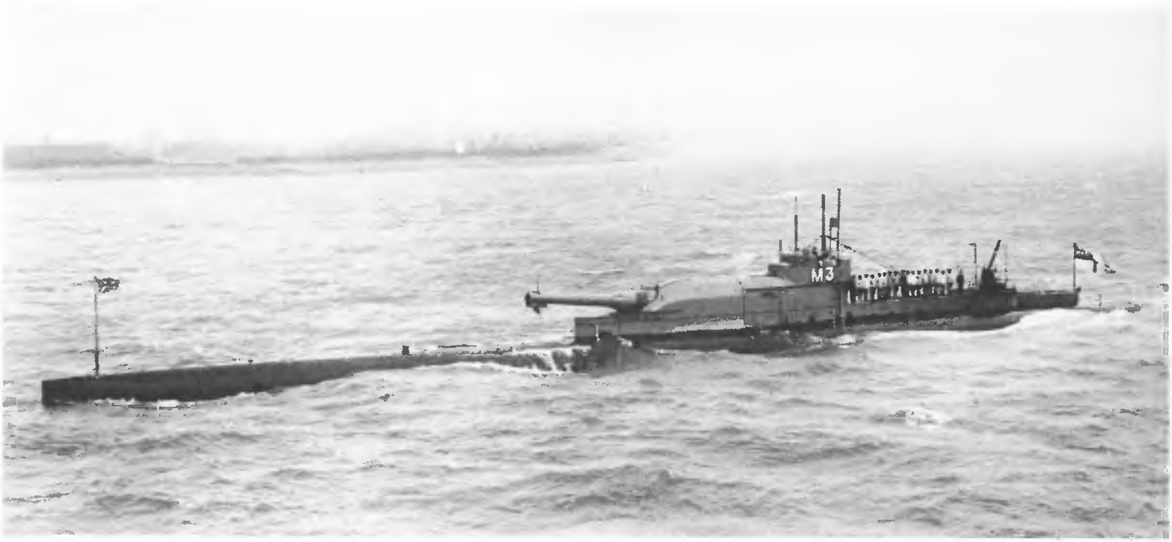
Tactical thinking at the beginning of World War One hoped for submarines to operate with the battle fleet as a second screen supplementing the destroyer screen, and with similar roles in protection and attack. This required boats fast enough and seaworthy enough to keep up with the fleet on the surface. Diesels were not sufficiently powerful or reliable, and following experiments with steam propulsion in the submarine SWORDFISH ordered in August 1913, steam-driven geared turbines were specified for the "K" class "Submarine Destroyers". The tactical concept was flawed, and the design proved unsatisfactory, the class having poor manoeuvrability and diving qualities, insufficient seakeeping ability, and poor habitability. Shutting down the steam system for diving required particular care if the boat's safety was not to be jeopardised.

Armstrongs first pair were built under the 1915 Emergency War Estimates to a Vickers design based on Admiralty specifications. When the faults in the concept were made manifest later boats already ordered were cancelled, including Armstrongs' last three.

Career

Both served with the Grand Fleet, but neither fired their torpedoes in anger.

K11 was sold on 4 November 1921 to C A Beard, and K12 on 23 July 1926 to Alloa Shipbreaking Co, Rosyth and Charleston.

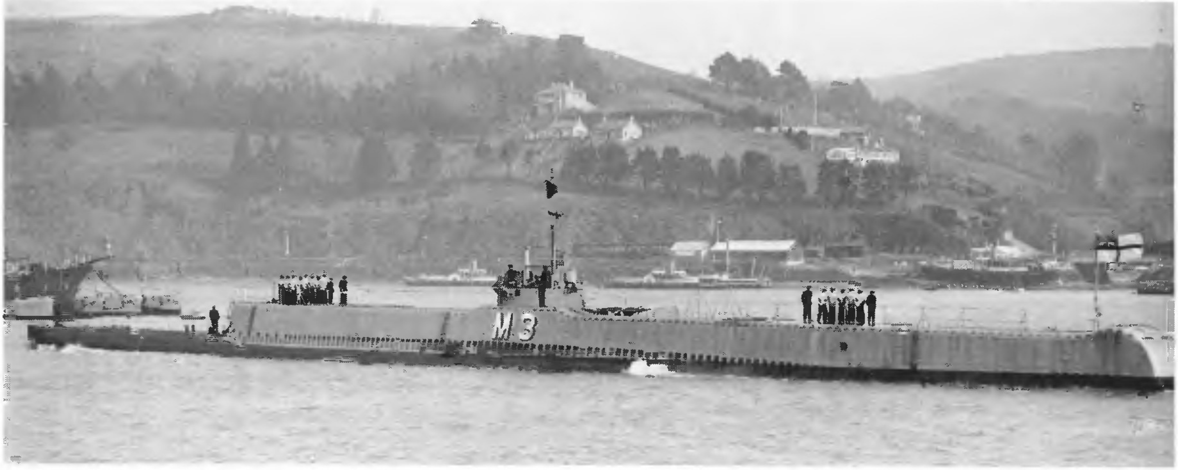


M 3 in 1922, still as completed with her 12in gun Photo : NMM N131

M3 M4
Great Britain

Yard & No	Laid down	Launched	Completed	Designer
M3				
High Walker 911	8 Dec 1916	19 Oct 1918	14 Jul 1920	DNC
M4				
High Walker 912	8 Dec 1916	28 Jul 1919	Not completed Sold 20 Nov 1920 to Armstrong's for scrapping	DNC

Displacement	1600/1950 tons
Dimensions	290 (302 ft 3 in *oa*) x 24 ft 8 in x 15 ft 9 in [88.4 (92.1) x 7.5 x 4.8]
Armament	1 x 12 in Mk IX 40 cal BL, 1 x 3 in AA, 4 x 12 in TT (bow)
Machinery	Two sets diesel engines (possibly by Armstrong Whitworth) 2400 BHP = 15.5 knots. Electric motors 1600 HP = 9.5 knots.
Fuel	76 tons oil. *Endurance* : 3800 miles at 10 knots surfaced. 10 miles at 9.5 knots underwater.



M 3 in the River Dart in 1930, after conversion to a minelayer. Photo : NMM N9945

General

Four "Submarine Monitors" were ordered in 1916. Though they replaced the cancelled K18 to K21, they were a completely new design. Planned for bombarding the Belgian coast clandestinely, their 12 in Mk IX guns were drawn from stock held for the FORMIDABLE and later classes of pre-dreadnoughts. The gun was loaded on the surface, but fired with the boat submerged and the muzzle just above water. A foresight was fitted to allow aiming through the periscope. Elevation was 20°, depression 2° and with 10° arc of training each side of the centreline.

Career

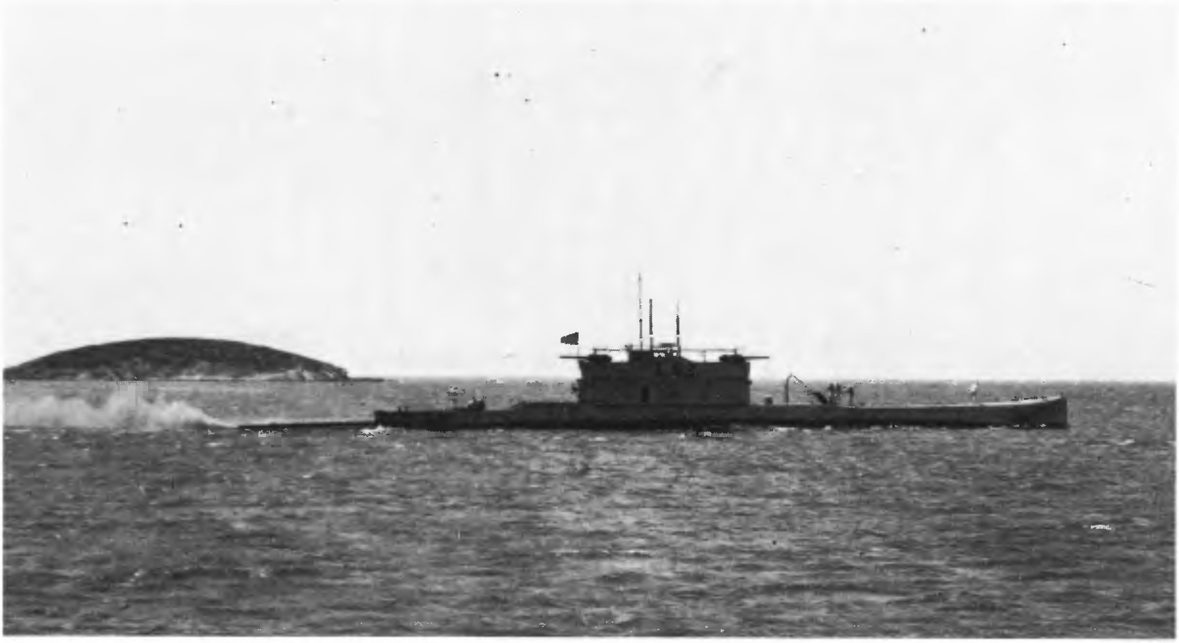
M3 saw no war service. From 1920 to 1921 she was attached to the submarine school. Portsmouth and Atlantic Fleet 1926-1927. In 1928 she was converted to a mine layer, being able to carry 100 S-type mines but with her 12 in and 3 in guns removed. After conversion her diving qualities were poor and she was sold in February 1932 to Cashmores arriving at Newport 13 April 1932 to be broken up. M4 was cancelled on the stocks 26 November 1918, but was launched in the following year in order to clear the slip. She was sold to Armstrongs 30 November 1921 for breaking up.

L52 L53

Great Britain

Yard & No	Laid down	Launched	Completed	Designer
L52 High Walker 923	16 May 1917	18 Dec 1918	19 Jan 1921	DNC
L53 High Walker 924	19 Jun 1917	12 Aug 1919	Left in tow 16 Sep 1920 and completed at Chatham DY 1925	DNC

Displacement	975/1164 tons.
Dimensions	230 ft 5 in (235 ft 3 in oa) x 23 ft 7 in x 15 ft 9 in [70.5 (71.06 oa) x 7.2 x 4.8]
Armament	6 x 21 in TT (bow). 2 x 4 in 40 cal QF.
Machinery	Two sets diesel engines by Armstrong Whitworth, 2,400 BHP. Electric motors 1600 HP. Speed 17.5/10.5 knots.
Fuel	Oil 78 tons Endurance 3800 at 10 knots/200 at 2 knots underwater.



L 52 in the years between the wars

Photo : IWM Q58553

General

The L class built under the 1917-18 war programme were much improved versions of the E Class. Armstrongs' pair belonged to Group 3 which had 21 in TTs and an extra 4 in gun; their range was limited, they lacked stability while surfacing, and attempts to go over 12 knots produced cavitation with no extra speed.

Two sisters, L67 and 68, were cancelled after being launched but after modification became the Yugoslav HRABRI and NEBOJSA (See page 186)

Careers

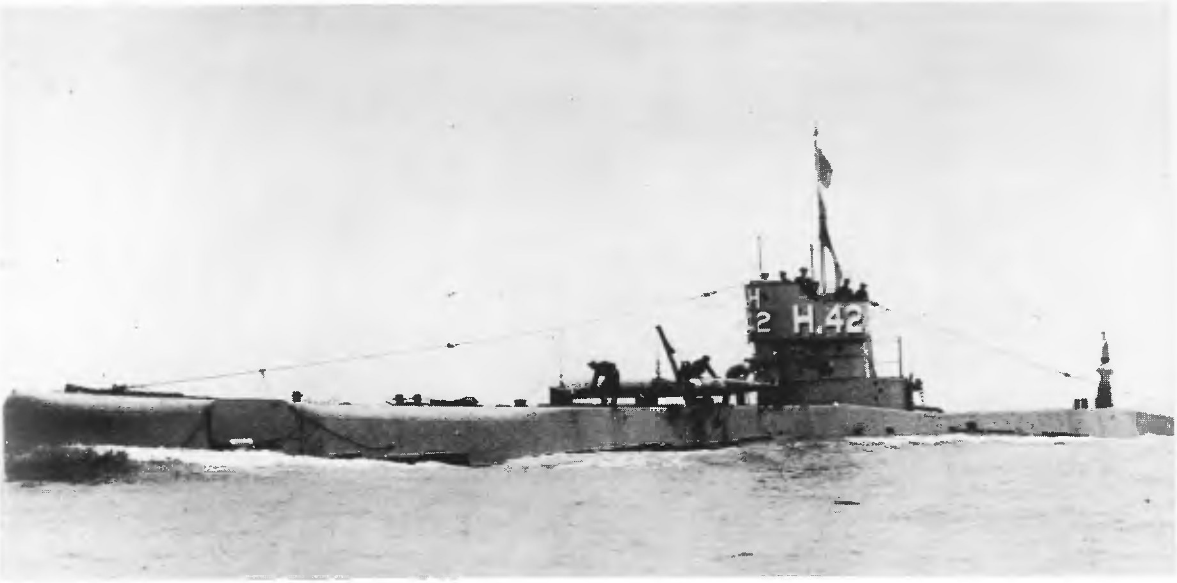
Both boats were completed slowly after launching. L52 was sold for scrapping in 1935 arriving Sept 1935 at Rees of Llanelly, L53 in 1938 arriving February 1939 at Pembroke Dockyard for scrapping by Wards.

H41 H42 H43 H44 H45 H46

Great Britain

Yard & No	Laid down	Launched	Completed	Designer
H41 High Walker 940	17 Sep 1917	26 Jul 1918	16 Nov 1918	DNC
H42 High Walker 941	21 Sep 1917	21 Oct 1918	18 May 1919	DNC
H43 High Walker 942	4 Oct 1917	3 Feb 1919	27 Nov 1919	DNC
H44 High Walker 943	12 Oct 1917	17 Feb 1919	20 Apr 1920	DNC
H45 High Walker 944	))			
H 46 High Walker 945	)Cancelled)			

Displacement	436/572 tons.
Dimensions	164 ft 7 in (171 ft 8 in oa) x 15 ft 9 in x 11 ft 3 in [50.1 x (52.1 oa) x 4.8 x 3.4]
Armament	4 x 21 in TT (bow).
Machinery	Two sets diesel 240 BHP each, by Ruston and Hornsby. Two electric motors 160 HP each. Speed 13/10.5 knots.
Fuel	16 tons. Endurance 1375 miles at 10 knots/ 10 miles at 9 knots.



H 42 with men on the casing working on a torpedo while under way. Photo : RN Submarine Museum

General

The H Class were single hulled coastal type submarines. The Armstrong boats belonged to the second group which had 21 in TTs instead of 18 in. As a whole these boats were highly successful being fast, handy, and quick diving, eminently suitable for the North Sea conditions for which they were designed.

Careers

H41 was scrapped in 1920 after being holed by the depot ship VULCAN. H42 was sunk with all hands after being rammed by the destroyer VERSATILE in 1922. H43 and H44 were used for training in World War Two, apart from a spell in 1940-41 when they were used operationally. H43 was sold in November 1944 and H44 in February 1945; both were broken up at Troon.

R9 R10

Great Britain

Yard & No	Laid down	Launched	Completed	Designer
R9				
High Walker 948	5 Dec 1917	12 Aug 1918	3 Nov 1918	DNC
R10				
High Walker 949	7 Dec 1917	5 Oct 1918	15 Mar 1919	DNC

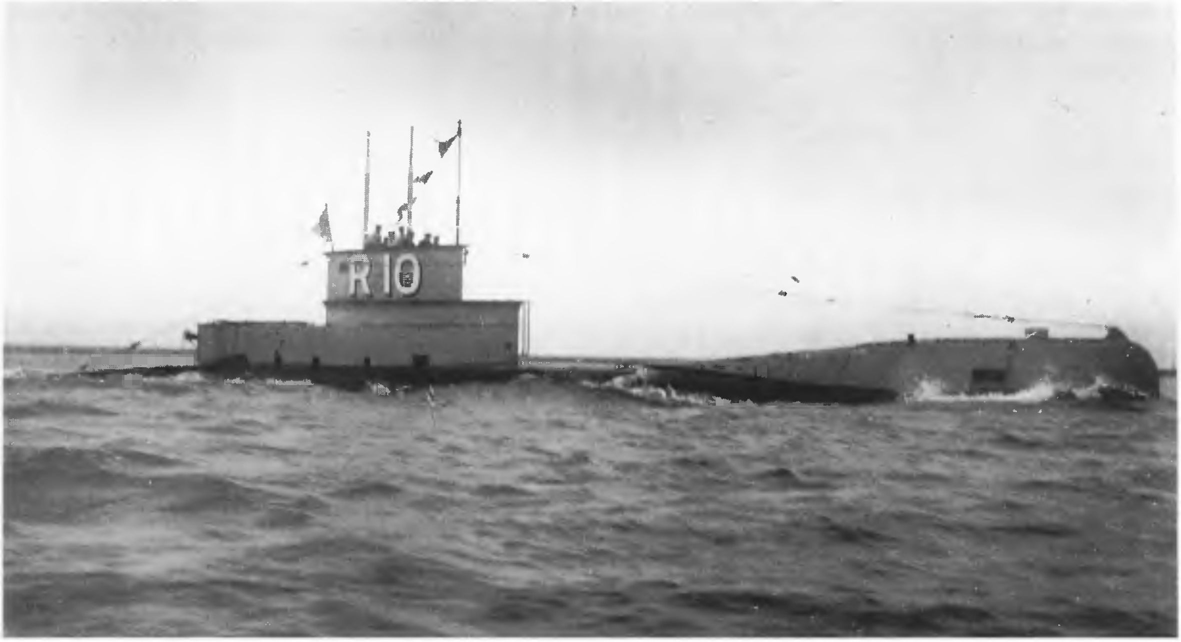
Displacement	410/499 tons
Dimensions	163 ft 9 in x 15 ft 6 in x 10 ft 9 in forward, 12 ft 1 in aft [49.9 x 4.7 x 3.28/3.68]
Armament	6 x 18 in TT (bow).
Machinery	1 set diesel; R9 by Ruston & Hornsby and R10 by North British Diesel, 240 BHP. 2 electric motors 1200 HP. Auxiliary propulsion motor 25 HP. Speed 9.5/15 knots.
Fuel	13¼ tons oil. Endurance 2000 miles at 9 knots surfaced. 15 miles at full power, 240 miles at 4 knots with auxiliary motor submerged

General

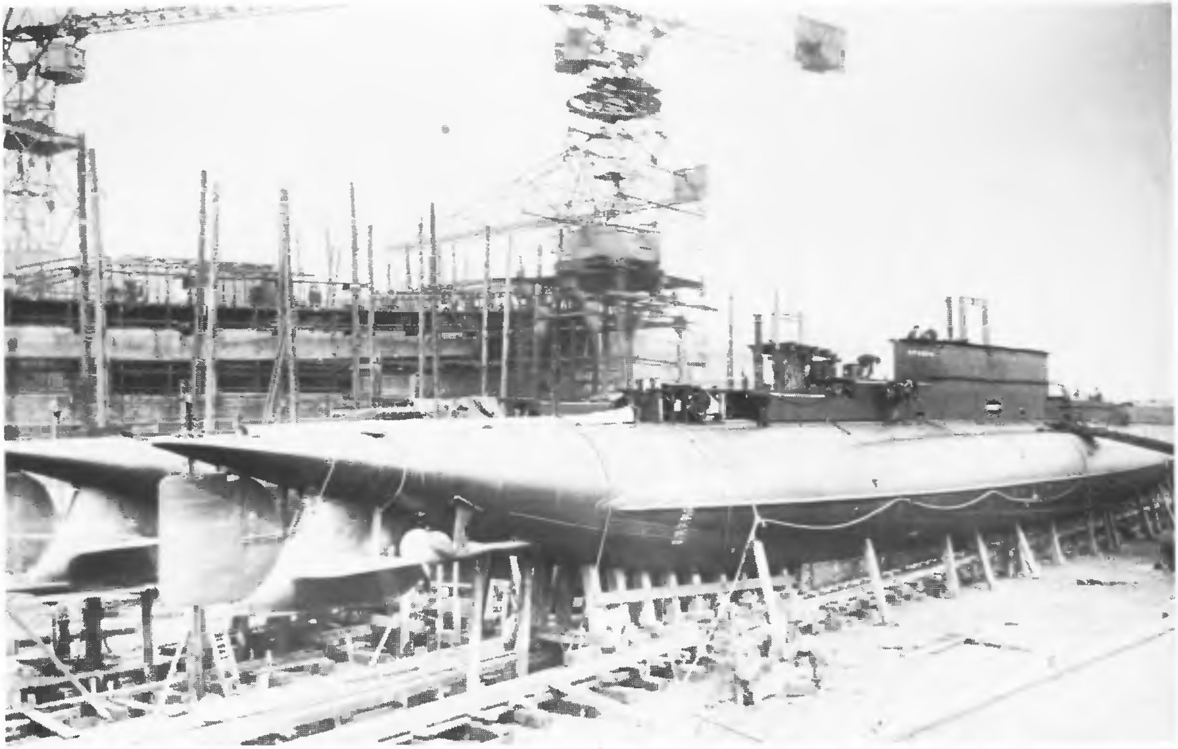
Designed as anti-submarine boats or hunter killers. The R Class had a powerful bow torpedo armament and a very high underwater speed. Generally successful but surface handling was poor.

Careers

R9 was sold 21 February 1923 to E Suren for breaking up and R10 was sold 19 February 1929 after several years service in the anti-submarine school at Portland. Arrived at Cashmores, Newport for breaking up March 1930.



R 10 off Portland while serving with the anti-submarine school in the 1920s Photo : IWM Q75669



HRABRI on the slip at Elswick, 1927, with NEBOJSA behind Photo : Vickers

HRABRI NEBOJSA

ex L 67 ex L 68

Yugoslavia

Yard & No	Laid down	Launched	Completed	Designer
L67				
High Walker 930	8 Nov 1917	16 Jun 1919		DNC
L68				
High Walker 931	5 Dec 1917	2 Jul 1919		DNC
HRABRI				
High Walker 1020			Relaunched 15 Jun 1927	
NEBOJSA				
High Walker 1021			Relaunched 15 Jul 1927	

Displacement	975/1164 tons.
Dimensions	236 ft 5 in oa x 24 x 13 [72,1 x 7,3 x 4,0]
Armament	6 x 21 in (533 mm) TT (bow) 2 x 4 in (102 mm) QF.
Machinery	2 sets diesels by Armstrong Whitworth 2400 BHP. Electric motors 1600 HP. Speed 15.7 knots/10 knots
Radius	Surface, 5,000 at 9 knots.

General

This pair, the last warships to be built by Armstrongs, were laid down as HM Submarines L67 and L68 but were cancelled by the RN in March 1919. After launching they were sold to Armstrong Whitworth in October 1919 and were towed to Elswick where they lay until 1926 and were taken back to High Walker, where they were hauled up on to building berths and reconditioned.

Careers

HRABRI ("Brave") was captured by Italian troops at Kotor on 17 April 1941, and renamed N3 but was considered to be unusable and scrapped later in the year. NEBOJSA ("Fearless") had escaped a few days earlier but was never operational; her batteries were in poor condition and structural damage meant that she could only dive to half her design depth. In 1946 she was renamed TARA. She was scrapped in 1958.

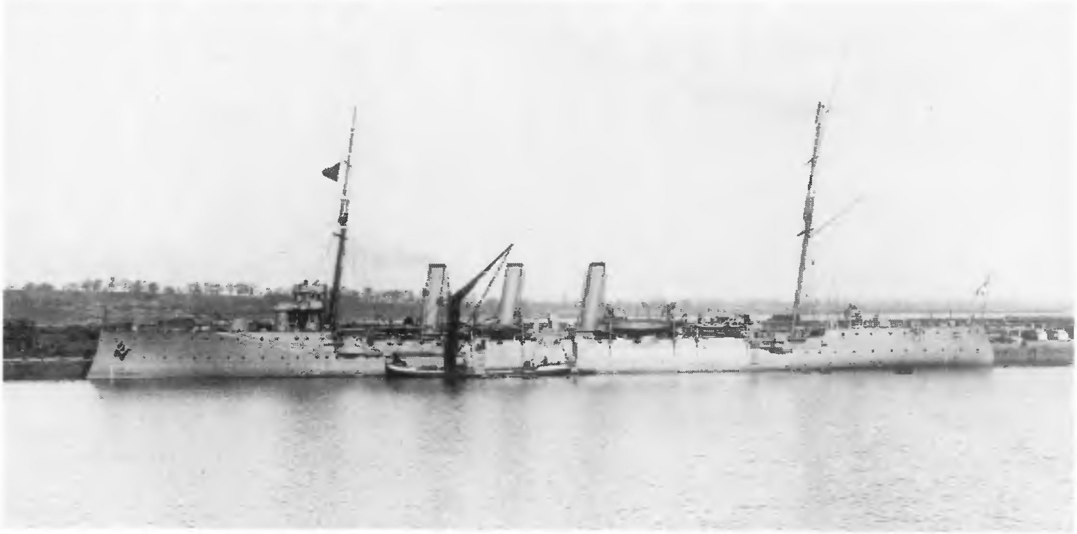
NEBOJSA at sea, about 1928 Photo : Vickers Archive, CUL

CHAPTER 7
SCOUTS AND LIGHT CRUISERS

Introduction

By the turn of the century the small third class cruisers which were designed primarily to act as the "eyes of the fleet", searching for enemy warships or observing harbours, had become outclassed by armoured cruisers and torpedo boat destroyers; over a period of 15 years the small cruisers' speed remained at 19-20 knots, while armoured cruisers were now capable of 23 knots, thus making the third class type very vulnerable. One solution, adopted by the USN in the Spanish-American War, was to use very fast merchant liners for scouting, but they required large crews and had no protection to their engines or boilers. Armoured cruisers did not exist in sufficient numbers to act in the scouting role.

The fast, weakly armed scout type, of limited endurance was designed to operate in conjunction with destroyer flotillas. In addition, more heavily armed cruisers with a large radius of action, but which also had to be fast, were needed to operate with the fleet and for service on distant stations. AMETHYST and her sisters were designed for fleet work and were some 2 knots faster than their predecessors and could be regarded as the first light cruisers. However their speed, even AMETHYST's, was still too slow and to achieve all the qualities needed, in terms of protection, gunpower, speed and endurance, larger ships had to be built, so that the BRISTOL class displaced 4800 tons.



AMETHYST soon after acceptance into service, 1905 Photo : WSPL

AMETHYST
Great Britain

Yard & No	Laid down	Launched	Final trials	Designer
Elswick 735	7 Jan 1903	5 Nov 1903	17 Mar 1905	DNC

Displacement	3000 tons.
Dimensions	360 (373 ft 6 in oa) x 40 x 14 ft 6 in [109.8 (113.8 oa) x 12.13 x 4.4]
Armament	12 x 4 in QF, 8 x 3 pdr QF, 2 x 18 in TT aw.
Armour	Deck: slopes 2 in over machinery, 1 in magazines and steering gear, ½ in remainder. flats 2 in over machinery, ¾ in remainder.
Machinery	3 shaft Parsons turbines by Parsons Marine Steam Turbine Co. 10 Yarrow boilers. Designed SHP ND 9800 = 21.75 knots. Trials SHP ND 13,000 = 23.63 knots.
Fuel	Coal. 300 tons normal, 700 tons maximum.
Complement	296

General

AMETHYST was one of the four 'Gem' or TOPAZE class, larger and faster than their predecessors as third class cruisers, being designed to work with the Fleet. AMETHYST was Admiralty designed and almost identical with her sisters except that she was the first warship in the world larger than a destroyer to have Parsons turbines. The success of the turbine installation was shown by the fact that she was 1.3 knots faster than her sister the TOPAZE and in addition was more economical in fuel at full power than her sisters, as shown below.

	Lb of coal per IHP	Miles per ton of coal
AMETHYST	1.75	4.22
TOPAZE	2.28	2.9
SAPPHIRE	2.328	2.86
DIAMOND	2.27	2.7
	(8 hour trial at 20 knots)	

However turbines were less efficient at low power: this was overcome by fitting AMETHYST with cruising turbines which came into operation in place of the main engines at lower speeds.

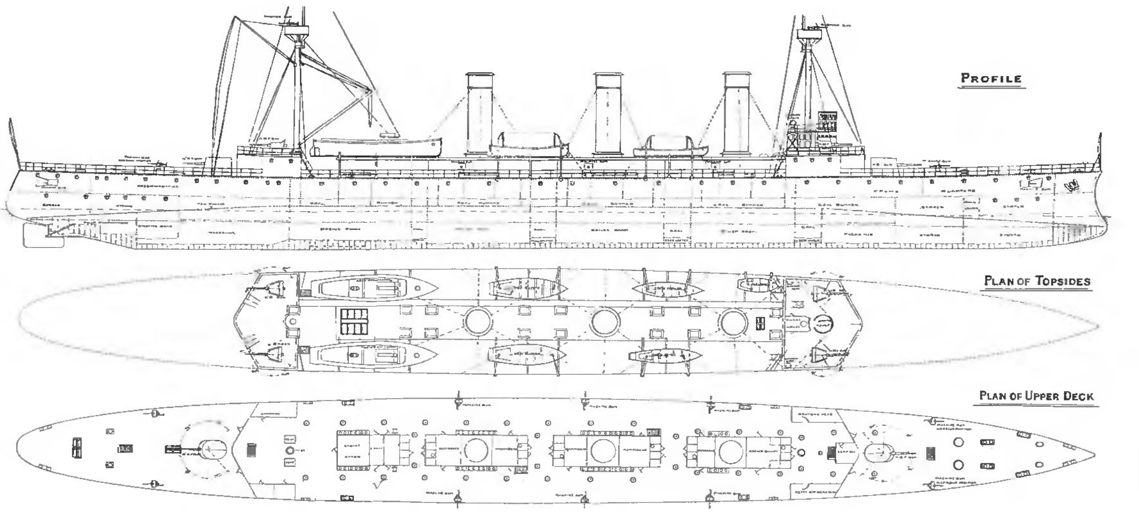
Originally ordered in May 1902, there were long delays because of the large number of machinery drawings which had to be submitted to the Admiralty. She should have been ready for launching in September 1903, but Armstrongs considered that it was their duty to submit proposals for strengthening the shell plating. Trials went on for a considerable time and there were difficulties with engine room ventilation. In October 1904, after preliminary trials, Perrett allowed himself the satisfaction of prophesying that the success of her turbine machinery "will not be without influence on Admiralty policy as regards this type of machinery for further vessels".

Career

She was part of the Atlantic Battle Squadron in 1905-07; nucleus crew Portsmouth 1907-09; served in the Atlantic on the South East Coast of America and the West Coast of Africa 1909-11. From January 1912 to 1914 she was attached to the 8th Destroyer Flotilla Home. At the outbreak of World War One she was part of the 3rd Destroyer Flotilla flying Commodore Tyrwhitt's broad pennant. In 1915 she took part in the Dardanelles operations and in the following year she was on patrol in the South Atlantic searching for German raiders, remaining there until 1919. Sold for scrapping 1 October 1920 to Towers, Milford Haven.

SCOUTS

In the Spring of 1901 Vice Admiral CCP Fitzgerald read a paper titled "A Design for a Fast Scout", before the Institution of Naval Architects. What he proposed may be seen as the origin of the Scout type. Drawing attention to the need for high speed craft, with good seagoing qualities in all weathers accompanied by great endurance, the admiral produced a design whose main features are summarised in table 7/1. Wisely, he had taken the precaution of enlisting the help of a professional naval architect, in this case Phillip Watts, who was still employed by Armstrongs. Watts drew up specifications and sketch plans so skilfully that when the formidable DNC, Sir William White, threw doubt on the vessel's ability to maintain a continuous speed of 23 knots at designed load, Watts was able to demonstrate, on the basis of his experience at Armstrongs, and the views of distinguished engineers such as Frank Marshall of Hawthorn Leslie and Alfred Yarrow, that his proposals were feasible. He estimated that he could get this speed with 66% of the designed horsepower, which was only 6% more than White's criterion of 60% designed horsepower for continuous seagoing speed.



The Scout design of 1901 produced jointly by Vice Admiral CCP Fitzgerald and Phillip Watts, as published in the Transactions of the Institute of Naval Architects.

This paper, and the ensuing discussion, must have aroused interest in the Navy, partly perhaps as Watts became DNC only 9 months after the paper was read; in May 1902 the Admiralty laid down specifications for eight fast scout cruisers. Departing for the first - and last - time from the usual procedure for ships larger than destroyers, the Admiralty did not issue detailed specifications and plans, but allowed the tendering firms great latitude, providing they kept within the following broad specifications.

Speed	25 knots on an 8 hour trial
Radius	3000 miles at 10 knots speed
Armament	10 x 12 pdrs: 8 x 3 pdrs: 2 x 18 in torpedo tubes
Protection	Sloping protective deck not less than 1½ in or equivalent side armour

The ships were to have reciprocating engines. The radius of action was to be determined by a 96 hour trial and the coal consumption during the last 48 hours of that trial: the coal carried to be such that at the middle of the trial bunkers should not be less than half full. The ships were to maintain a speed not less than 25 knots for eight hours, fully equipped, carrying not less than one half of the quantity of coal needed for 3000 miles at 10-12 knots, ie, 150 tons, in the first hour of the eight hour trial. Six runs were to be taken on the measured mile, and the speed and corresponding revolutions thus obtained to be used in estimating the speed for the remaining seven hours. They were to be armed with no fewer than 6 x 12 pdrs with 150 rounds per gun, 8 x 3 pdrs with 300 rounds per gun, and 2 x 18 in torpedo tubes with two torpedoes. The protective deck was to be not less than ⅝ in on the flat, 1½ in on slopes; vertical armour could be an alternative: the maximum tensile strength was not to exceed 6 tons for mild steel, or 8 tons for high tensile. Metacentric height had to be 2½ - 2¾ ft fully laden, and 1½ ft light: the range of stability was to be not less than 60 degrees.

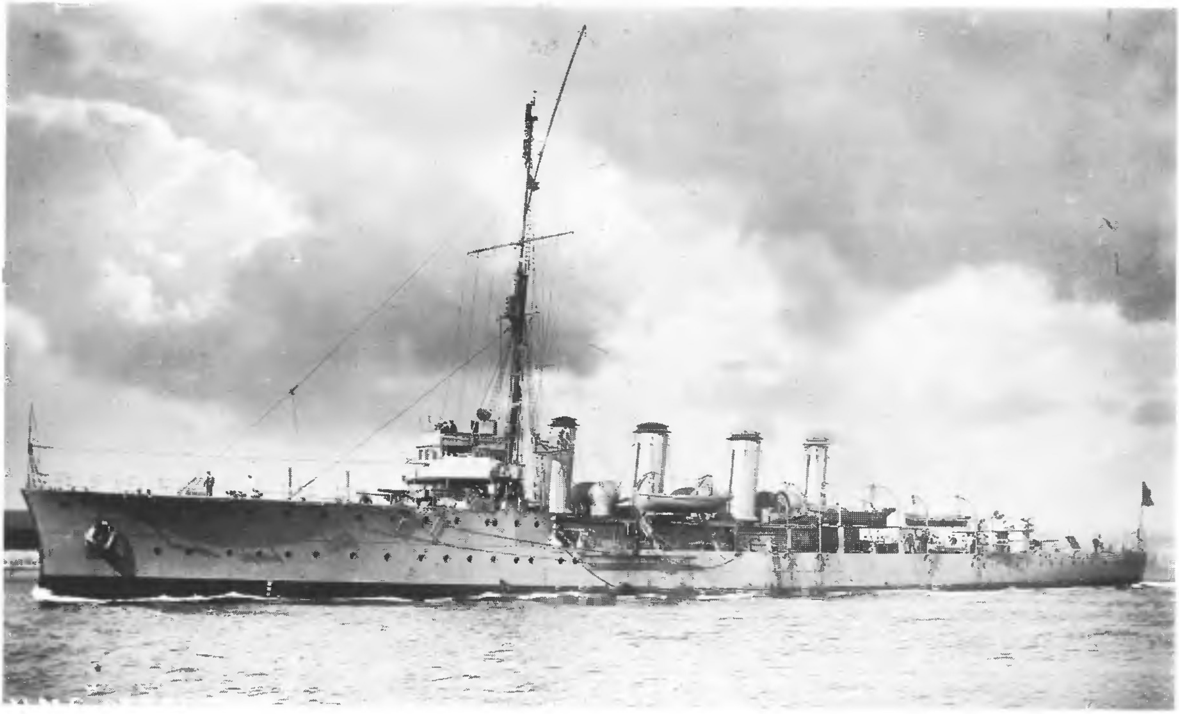
Admiral Fitzgerald presented a second paper "The New Scouts" at the INA in 1906 and in the discussion Watts elaborated on the characteristics giving a useful view of the Admiralty's thinking. Watts explained that designs and tenders were given to six firms in May 1902 and received by July. The four firms, Armstrongs, Fairfields, Lairds and Vickers which subsequently were to receive orders were selected, Thames Iron Works and John Brown having been rejected, the four firms designs were carefully examined, and in November they were informed of the modifications required. These were received in December, again examined, and further modifications were requested in February 1903, so that it took 8 to 9 months to produce the several designs and bring them into reasonable uniformity; most underwent very considerable change.

Compared with the "New Scouts", Fitzgerald's 1901 ship was better armed, a little slower, more heavily constructed, had greater freeboard amidships and would have carried much more fuel, with a greater endurance. Altogether Fitzgerald's proposed ship would have been an improvement on those built.

The main features of the four pairs are given in the table and compared with the Fitzgerald scout. One of the weakest features of the Admiralty design was the quite inadequate armament of 12 pdrs, which were not even powerful enough to disable destroyers. Fitzgerald's design had a flush deck and would probably have been a better seaboat. Her armament was heavier with a single 4 in gun mounted in an enclosed mount, bow and stern, with two 4 in guns in open mounts above these guns, and to each side. Watts would have liked to have substituted 6 in guns, but this would have meant increasing the displacement to 4250 tons, which Fitzgerald was not prepared to accept. Watts and Fitzgerald did consider installing turbines in their 1901 scout, but rejected these in favour of reciprocating engines; unfortunately no reason for this decision was given in the paper. Perrett wanted to instal turbines in the Armstrong pair, but this proposal was turned down by the Admiralty.

In 1906 Fitzgerald compared his 1901 scout with the four pairs as built, and concluded that his proposals were superior, particularly as the Admiralty scouts had much poorer endurance. Watts then found himself in the unusual position of having been responsible for the 1901 design while at Armstrongs, while as DNC he had been responsible for the detailed specifications of the new scout.

The scouts developed through the BOADICEAs, BLONDEs and ACTIVEs to the ARETHUSAs, "Cs" and "Ds" all of which were primarily built for North Sea operations.



ATTENTIVE as completed with 12 pdr armament, w/t gaff and semaphore at her one masthead.

Photo : NMM BM61

Table 7/1
SCOUT CRUISERS

Name	ADVENTURE	FORWARD	PATROL	SENTINEL	1901 Scout
Builder	Armstrong	Fairfield	Laird	Vickers	-
Length (pp)	374 ft	365 ft	370 ft	360 ft	400ft
Breadth,extreme	38 ft 3 in	39 ft 2 in	38 ft 9 in	40 ft	44 ft
Length/Beam ratio	9.8:1	9.3:1	9.5:1	9:1	9.1:1
Draught	12ft 3 in	14 ft 2 in	14 ft 2 in	14 ft 1 in	14 ft
Displacement (Navy List)	2,640 tons	2,860 tons	2,900 tons	2,880 tons	3,800 tons
Depth (moulded)	23 ft	23 ft	23 ft 11 in	24 ft 6 in	ca 29 ft
Freeboard - bow	20 ft ½ in	20 ft	20 ft	20 ft	18 ft 6 in
Freeboard - amidships	10 ft ¾ in	11 ft	11 ft	11 ft	13 ft 6 in
Boiler rooms	3	3	4	3	3
Boilers	12 mod Yarrow	12 Thornycroft	12 Laird-Normand	12 Vickers Express	Yarrow
Grate area	784 sq ft	752 sq ft	656 sq ft	716 sq ft	-
Heating surface	42,686 sq ft	42,960 sq ft	43,800 sq ft	44,053 sq ft	48,000 sq ft
Working pressure	250	260	275	280	250
HP cylinders	Four 22 in	Two 31½ in	Two 32½ in	Two 32 in	
IP cylinders	Four 34 in	Two 50½ in	Two 51½ in	Two 52 in	
LP cylinder	Four 53 in	Four 57 in	Four 58 in	Four 61 in	
Length of stroke	25½ in	30 in	30 in	30 in	30 in
Bunker capacity (coal)	450 tons	500 tons	600 tons	410 tons	500 tons (normal)
	1200 tons (maximum)				
IHP (trials)	15,850	15,018	16,433	17,488	17,000 (estimated)
Speed, kts,(trials)	25.42	25.16	25.06	25.07	25 (estimated)
Armament	10 x 12 pdr 8 x 3 pdr 2 x 18 in TT	10 x 12 pdr 8 x 3 pdr 2 x 18 in TT	10 x 12 pdr 8 x 3 pdr 2 x 18 in TT	10 x 12 pdr 8 x 3 pdr 2 x 18 in TT	6 x 4 in 12 mg

Sources : Trans INA **43**, 33, 34; **48**, 2, 4, Plate 39: Particulars Book, 48.

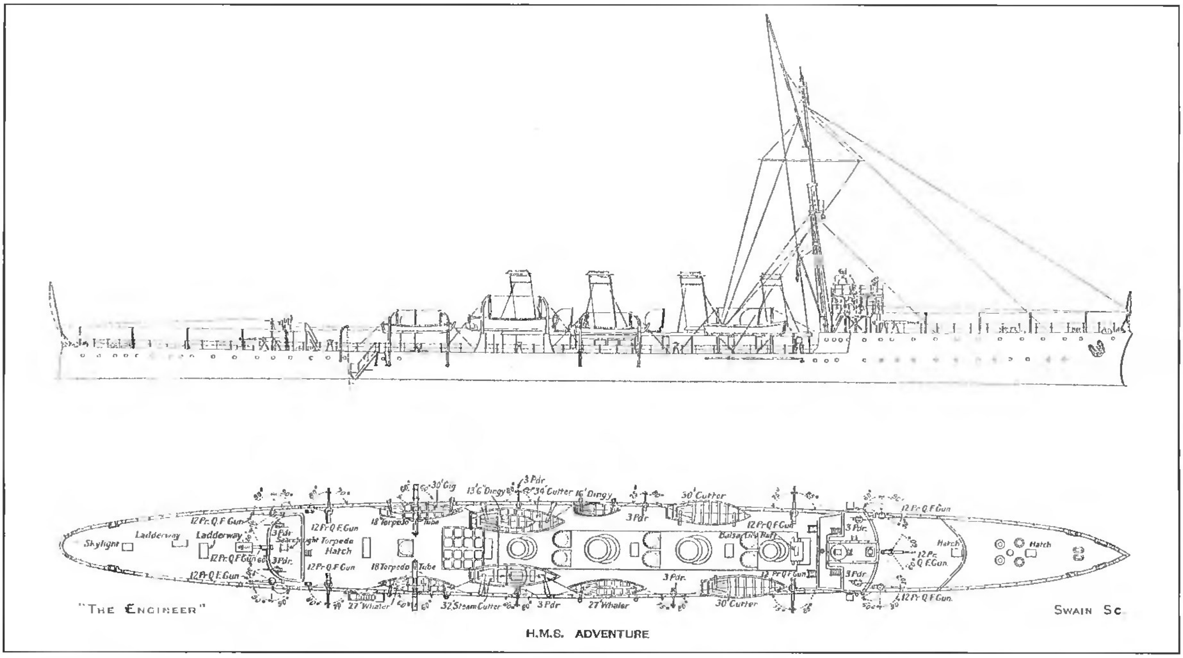
ADVENTURE ATTENTIVE

ex EDDYSTONE

Great Britain

Yard & No	Laid down	Launched	Final trials	Designer
ADVENTURE				
Elswick 741	9 Jan 1904	8 Sep 1904	6 Nov 1905	J R Perrett
ATTENTIVE				
Elswick 748	9 Jan 1904	22 Nov 1904	7 Feb 1906	J R Perrett

Displacement	2910 tons full load.
Dimensions	374 (395 oa) x 38 ft 3 in x 13 ft 3 in [114 (120.4) x 11.66 x 4.03]
Armament	10 x 12 pdr QF, 8 x 3 pdr QF, 2 x 18 in TT. Rearmed 1913 with 9 x 4 in QF replacing the 12 pdrs.
Armour	Deck ¾ in flats, 2 in on slopes over machinery and magazines, ends 3/4 in. CT 3 in.
Machinery	2 sets 6 cylinder VTE by R & W Hawthorn Leslie. 12 Yarrow watertube boilers. Designed IHP 10,000 = 25 knots. Trials: ADVENTURE IHP 15,850 = 25.42 knots. ATTENTIVE IHP 16,212 = 25.88 knots.
Fuel	Coal. 456 tons maximum. Radius 3000 miles at 10 knots.
Complement	286



ADVENTURE, plan published in The Engineer, 4 August 1905

General

The first designs were submitted in July 1902. Perrett submitted two, one with side armour and one with a protective deck. There were delays while awaiting approval for the drawings for machinery and boiler rooms. By March 1903 the protected deck design had been accepted subject to certain modifications: in the same month the first cruiser, which had been assigned the name of EDDYSTONE, was renamed ATTENTIVE. One ship in each pair had been assigned the name of a prominent offshore rock off Great Britain but the names were changed in March, one reason being possible confusion in signals and reports. In May 1903 the Admiralty notified the firm that the designs had been accepted subject to minor modifications, but the keels were not laid down until January 1904, because of the Admiralty delaying final approval. Armstrongs proposed six-cylinder engines to reduce vibrations and so as to make glacis plates over the cylinders unnecessary.

Careers

ADVENTURE

Leader of the 1st DF, Home Fleet 1907-10: attached to 2nd DF Home Fleet 1910-13: 6th DF 1913-14. In World War One she served off the Belgian coast with the 6th flotilla, Dover patrol in 1914-15. Flagship at Queenstown 1915-17, convoys to Gibraltar 1918, Mediterranean 1918-19. By the end of the war mounted 2 x 6 in, 4 x 4 in, 1 x 3 in AA and no TTs. Sold 3 March 1920 to Wards, Morecambe.

ATTENTIVE

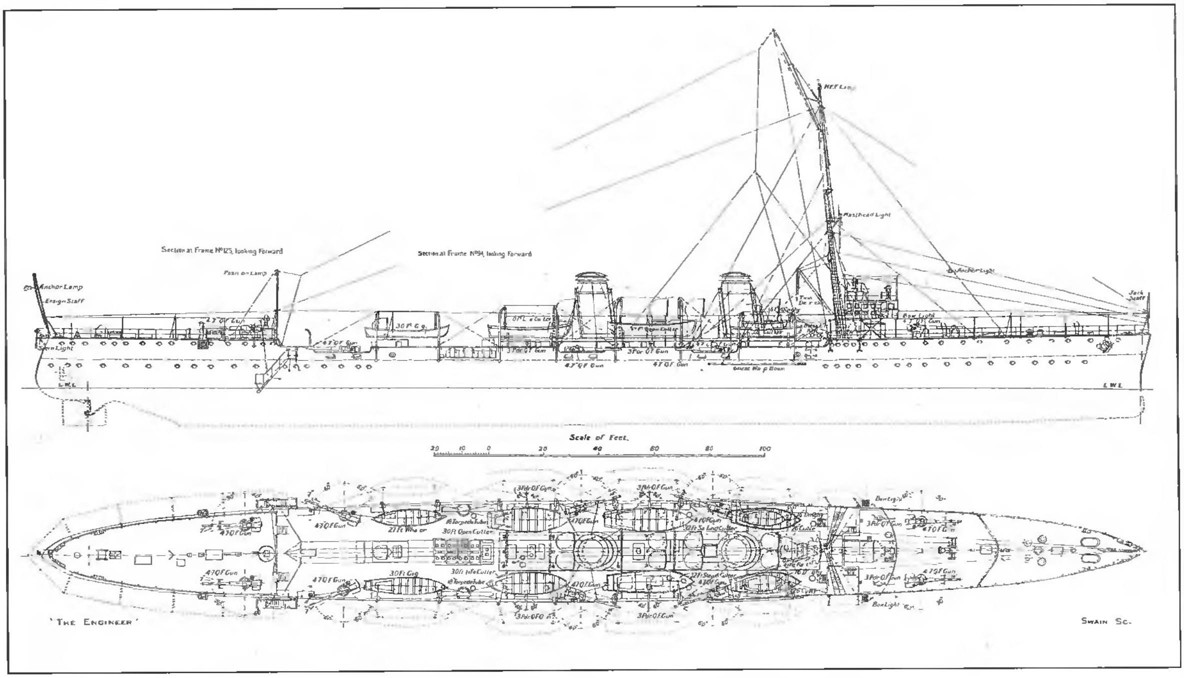
Leader 3rd DF 1909-10. 2nd DF Home Fleet 1910-12. Attached 1st DF Home Fleet 1913. Leader 6th DF Portsmouth. 6th DF Dover 1914-18 during which time a 6 in gun was fitted on the forecastle. Gibraltar convoys 1918. White Sea 1918. On disposal list 1918 and sold 12 April 1920 to Wards, Preston.

BAHIA RIO GRANDE DO SUL

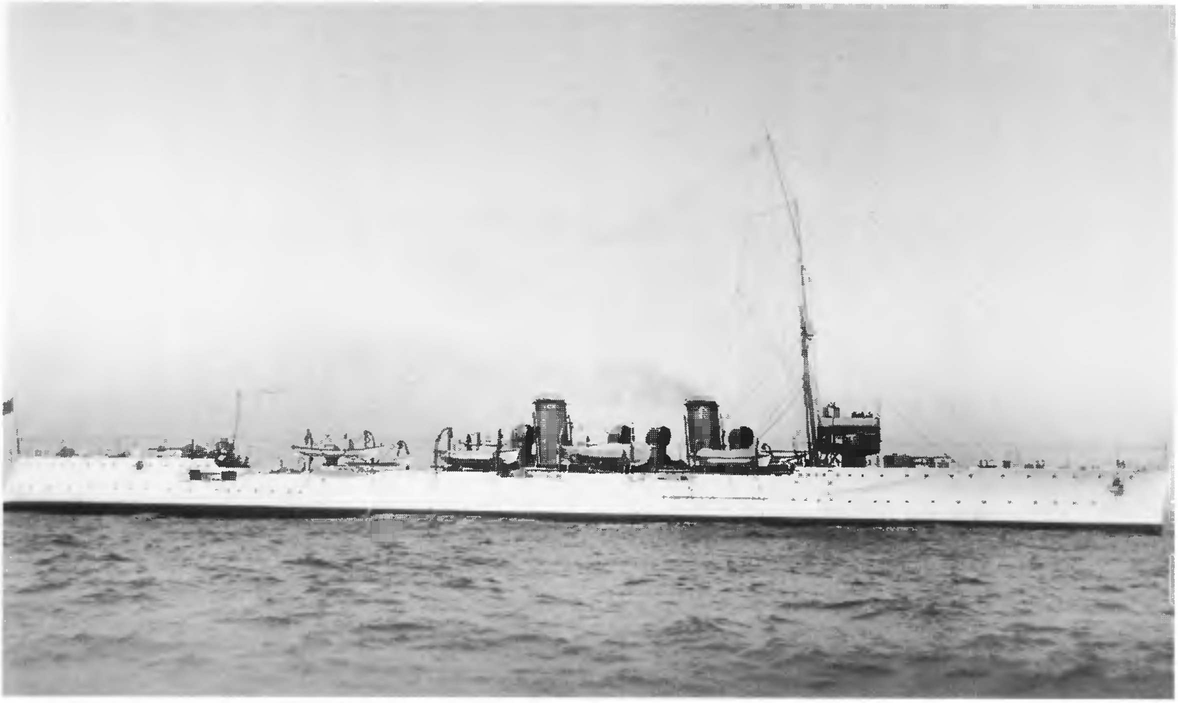
Brazil

Yard & No	Laid down	Launched	Final trials	Designer
BAHIA Elswick 809	19 Aug 1907	0 Jan 1909	2 Mar 1910	J R Perrett
RIO GRANDE DO SUL Elswick 810	30 Aug 1907	20 Apr 1909	14 May 1910	J R Perrett

Displacement	3100 tons.
Dimensions	380 (401 ft 6 in oa) x 39 x 13 ft 6 in [115.8 (122.4 oa) x 11.9 x 4.08] Freeboard amidships 10 ft 2½ in.
Armament	10 x 4.7 in QF, 6 x 3 pdr QF, 2 x 18 in TT aw.
Armour	Deck. 1½ in slopes over machinery and magazines, ¾ in elsewhere, ¾ in flats. CT 3 in.
Machinery	3 sets Parsons turbines by Vickers. 10 Yarrow boilers. Designed SHP 18,000 = 26.5 knots. Trials. BAHIA SHP 20,016 = 27.016 knots. RIO SHP 22,830 = 27.41 knots.
Fuel	Coal. 150 tons normal, 650 tons maximum.
Complement	300



BAHIA and RIO GRANDE DO SUL, plans published in The Engineer for 20 May 1910



BAHIA as completed, 1910 Photo : NCL

General

This pair were ordered in May 1907 by the Brazilian Government under the 1906 revision of their modernisation programme. They were a little longer than the ADVENTURE and ATTENTIVE, but were much more heavily armed, and were nearly $1\frac{1}{2}$ knots faster, because of their having Parsons turbines instead of reciprocating engines.

Before Eustace Tennyson D'Eyncourt left Armstrongs to become DNC in 1912 he drew up an outline design for an enlarged BAHIA.

Displacement	4000 tons.
Dimensions	420 x 43 x 14 ft 3 in [128 x 13.1 x 4.3]
Armament	8 x 6 in, 6 x 3 pdr, 2 x 21 in torpedo tubes
Armour	Deck $\frac{3}{4}$ in - $1\frac{1}{2}$ in
Fuel	Coal: 200 tons normal, 800 tons maximum

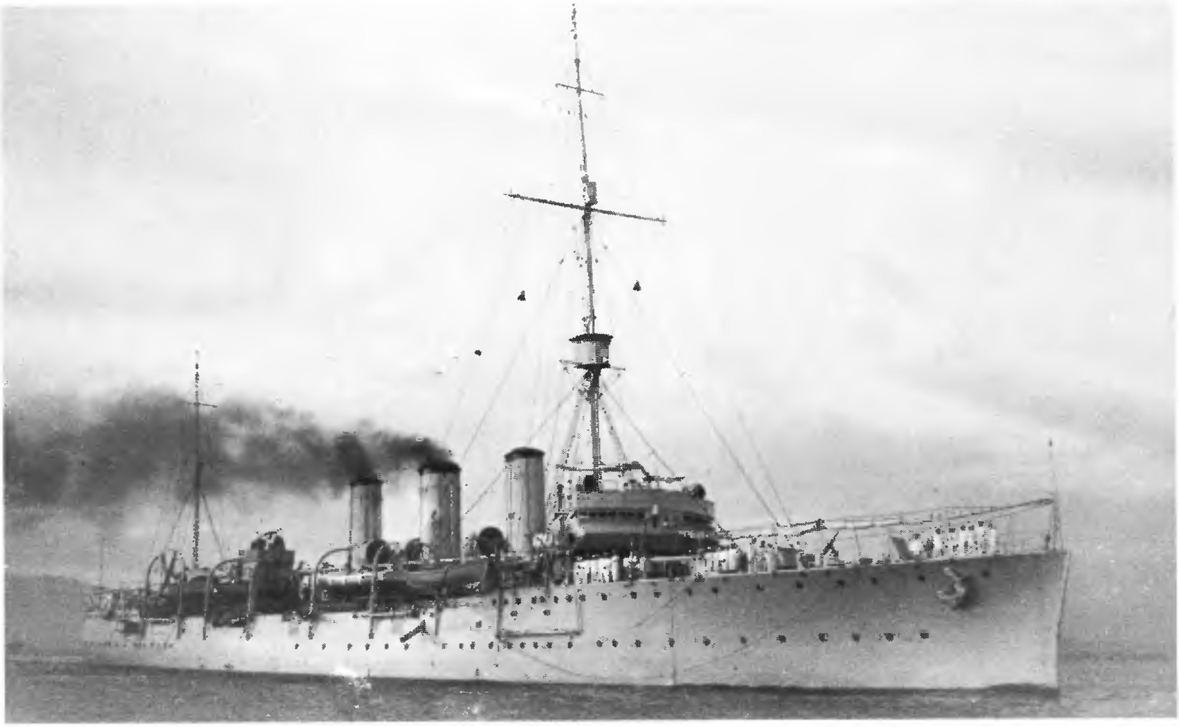
Nothing came of this design.

They were extensively re-fitted at Rio in 1925-26. New engines and oil-fired boilers increased their speed to 28 knots; three tall funnels replaced the original two short ones. Four 3 in AA guns were added and twin 21 in TT's replaced the single 18 in. During World War Two they were fitted with radar, 20 mm AA and depth charge racks at the stern.

Careers

On her way out to Brazil in March 1910 BAHIA had to be towed to Rio because of boiler failure due to the incompetence of her engine room staff. In November the crew of BAHIA together with those of the MINAS GERAES and SAO PAULO took part in a mutiny caused by excessive corporal punishment and poor pay. The short-lived mutiny was successful, the sailors gaining important concessions.

Immediately before Brazil joined the Allies in World War One on 26 October 1917, the two scouts formed part of the Southern Patrol off the Brazilian coast. In July 1917 they were part of the Naval Division in War Operations (DNOG) and served off the west coast of Africa, based at Dakar. Early in November 1918 the DNOG, less RIO GRANDE DO SUL, sailed for the Mediterranean, but the armistice intervened before they saw any action.



BAHIA in 1942, with three funnels, and US type wind baffles on the front of her bridge. At this time RIO carried a single band round her third funnel, but was otherwise identical in appearance. Photo : WSPL

In World War Two, when Brazil was again one of the Allied powers, both served as convoy escorts. On 4 July 1945 when BAHIA was conducting anti-aircraft exercises by firing at a kite; a gunner firing a 20 mm gun unintentionally hit a depth charge stowed in the stern, which exploded, with the BAHIA sinking so quickly that fewer than half of the crew survived. RIO GRANDE DO SUL was discarded in 1948.

LIGHT CRUISERS

NEWCASTLE

Great Britain

Yard & No	Laid down	Launched	Accepted	Designer
Elswick 820	Jan 1909	25 Nov 1909	13 Sep 1910	DNC

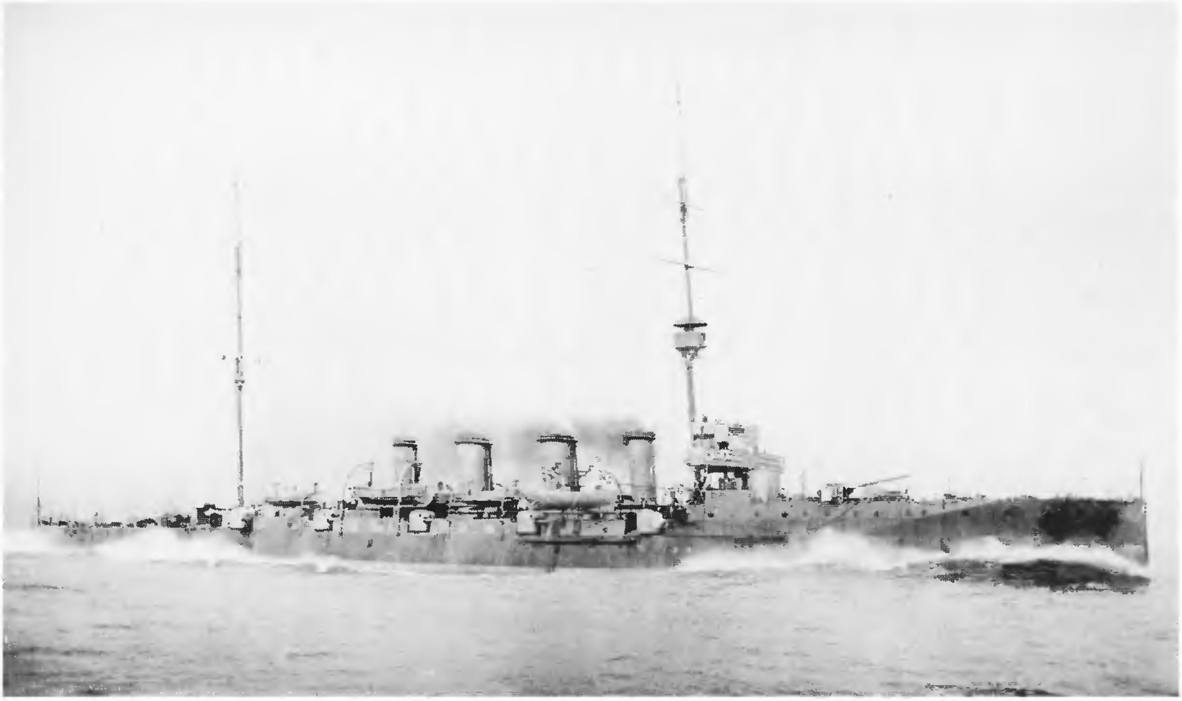
Displacement	4820 tons
Dimensions	430 (453 oa) x 46 ft 10 in x 15 ft 3 in [131.1 (138.1 oa) x 14.26 x 4.6]
Armament	2 x 6 in BL, 10 x 4 in BL, 4 x 3 pdr QF, 2 x 18 in TT submerged broadside.
Armour	Nickel steel. Deck: bow to magazines 3/4 in; magazines and machinery spaces, slopes 1 1/4 in-3/4 in, flats 1 in; steering gear 2 in. CT 6 in
Machinery	4 shaft turbines by Wallsend Slipway & Engineering Co. 18 Yarrow boilers. Designed SHP 22,000 = 25 knots. Trials SHP 25,410 = 26.266 knots.
Fuel	Coal, 1361 tons maximum. Oil 284 tons.
Complement	376

General

The Scouts and their successors of the BOADICEA, BLONDE and ACTIVE classes provided the fast, seaworthy ships needed to work with the Fleet destroyer flotillas in the North Sea, but something with a longer range and endurance was needed to operate world-wide in defence of commerce. The "Towns" were designed to fulfil this need. Larger than the ACTIVEs, with a heavier armament, and with greater fuel and stores capacity, the BRISTOL class were the first of the "Towns". The mixed armament however was a retrograde step, and they were wet amidships in anything of a seaway.

During NEWCASTLE's trials there were problems with her turbine blading. These were overcome, and she exceeded her designed speed by 1¼ knots.

Career
China 1910-14. Pacific 1915-16. Mediterranean 1917. South East coast of America 1918-19. In reserve 1919-20. Sold 9 May 1921 to Wards. Arrived Lelant for breaking up 3 May 1923.

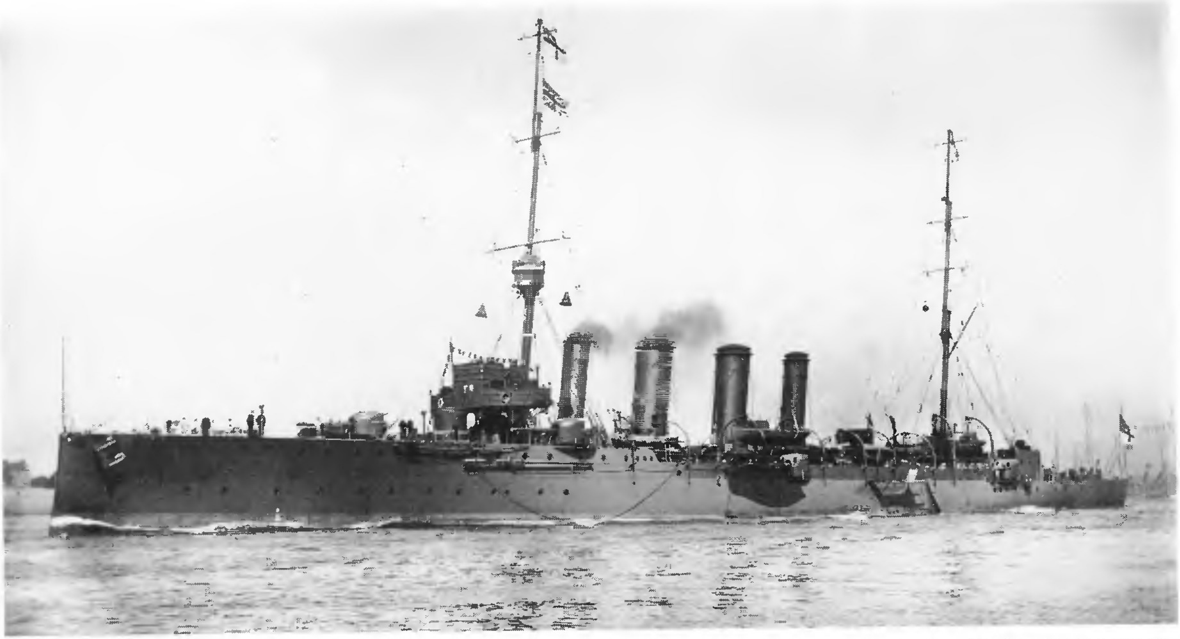


NEWCASTLE on trials before acceptance. Note the short funnels, which were raised soon after her entry into service
Photo : Engineering

WEYMOUTH
Great Britain

Yard & No	Laid down	Launched	Final trials	Designer
Elswick 827	20 Jan 1910	18 Nov 1910	6 Sep 1911	DNC

Displacement	5250 tons (5257 tons on trials).
Dimensions	430 (453 oa) x 48 ft 6 in x 15 ft 6 in [131.1 (138.1 oa) x 14.7 x 4.7]
Armament	8 x 6 in BL, 4 x 3 pdr QF, 1 x 12 pdr QF fieldgun. 2 x 21 in TT submerged broadside.
Armour	Nickel Steel. Deck: bow to magazines ¾ in; magazines and machinery spaces: slopes 1¼ in - ¾ in, flats 1 in; steering gear 2 in. CT 6 in.
Machinery	4 shaft Parsons turbines by R & W Hawthorn Leslie. 12 Yarrow boilers. Designed SHP 22,000 = 25 knots. Trials SHP 23,532 = 25.951 knots.
Fuel	Coal 1284 tons. Oil 260 tons.
Complement	393.



WEYMOUTH in 1912, as first completed

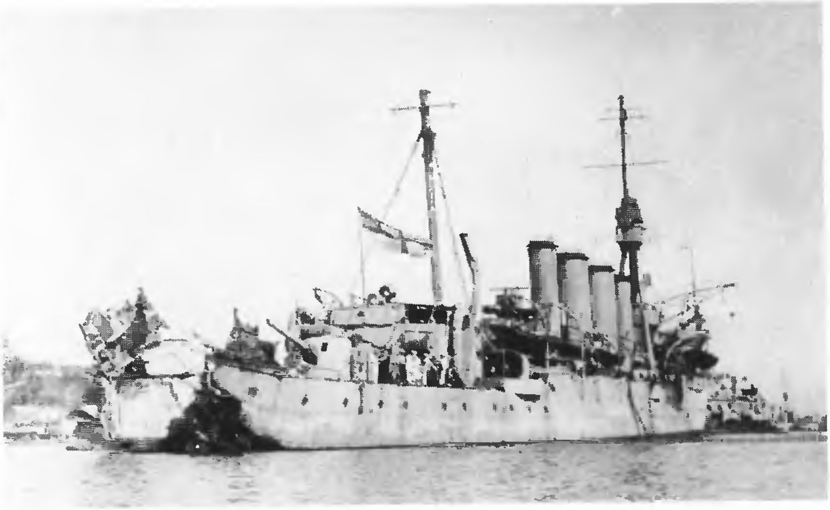
Photo : NMM N1545

General

One of the class named after her. An improvement on her immediate predecessors of the BRISTOL class in that she mounted an all 6 in armament, three of which were mounted on the forecastle deck which extended further aft than in the BRISTOLs. There were boiler problems on her 30 hour trials but the final full power trials were satisfactory. The whole class was highly successful.

Career

Home Fleet 1911-13. Mediterranean 1913-14. East Africa 1914-15. Mediterranean 1915-16. Grand Fleet 1916-17. Mediterranean 1917-18. Adriatic 1918-1919, stern blown off by a torpedo from Austrian submarine, U13, while bombarding Durazzo 2 October 1918. Post war: South America, then Nore reserve. Sold 2 October 1928 to Hughes Bolkow, Blyth.



WEYMOUTH in Brindisi after being torpedoed, October 1918. By this time she had been fitted with a tripod foremast, and had lost her main topmast

Photo : MPL

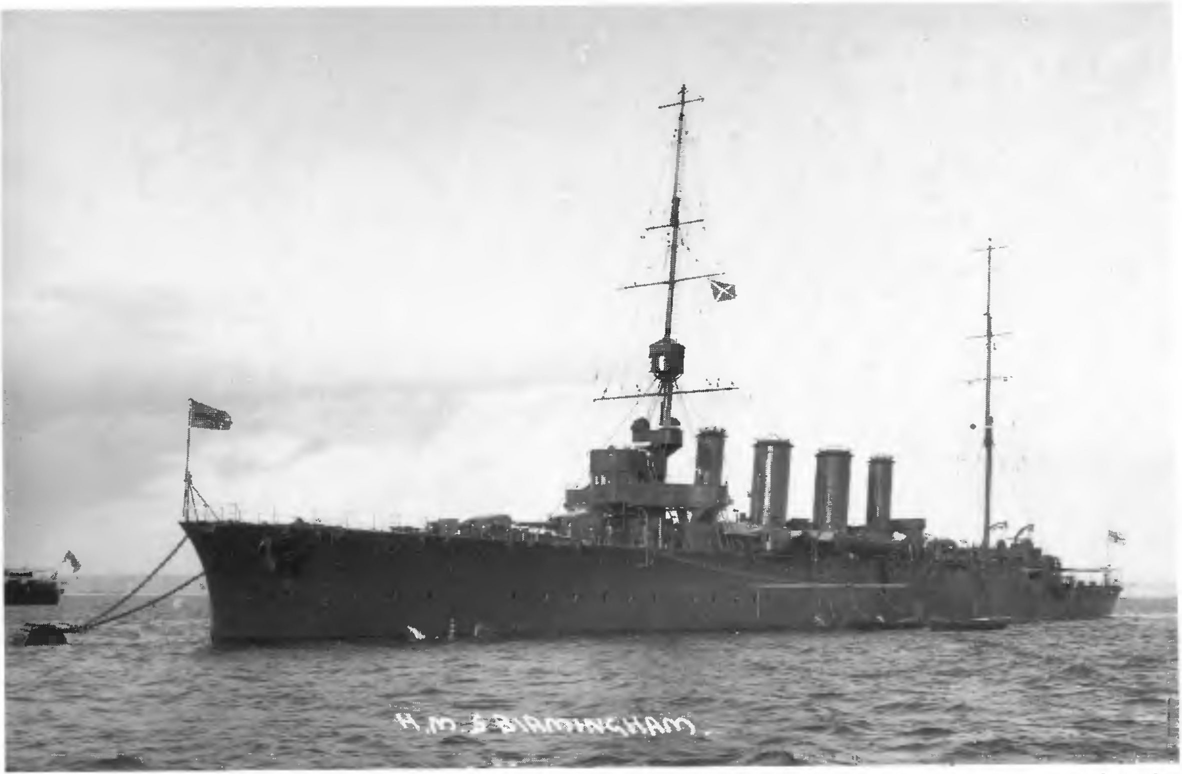
BIRMINGHAM
Great Britain

Yard & No	Laid down	Launched	Handed over	Designer
Elswick 851	10 Jun 1912	7 May 1913	30 Jan 1914	DNC

Displacement	5440 tons.
Dimensions	430 (456 ft 9 in oa) x 49 ft 6 in x 15 ft 10 in [131.1 (139.2 oa) x 15.1 x 4.8]
Armament	9 x 6 in 45 cal BL, 5 x 3 pdr sub-calibre, 1 x 12 pdr 4 cwt QF fieldgun. 2 x 21 in TT submerged broadside. 1 x 3 in AA added 1915.
Armour	2 in Nickel steel on 1 in HT amidships, 1¾ in Nickel steel on ¾ in HT forward, 1¼ Nickel steel on ¾ in HT aft. Deck 1 ½ in - ⅜ in.
Machinery	2 shaft Parsons turbines by R & W Hawthorn Leslie. 12 Yarrow boilers. Designed SHP 25,000 = 25 knots. Trial SHP 26, 040 = 26.09 knots.
Fuel	Coal 1165 tons. Oil 235 tons.

General
Again BIRMINGHAM was the name ship of her class, the final development of the "Towns" with six 6 in mounted at forecastle deck level forward: three 6 in aft at main deck level. Like her predecessors of the CHATHAM Class, BIRMINGHAM had side armour.

Career
Grand Fleet 1914-19. Took part in Battles of Heligoland, Dogger Bank and Jutland. Post-war, 6th LCS Africa 1919-21. Nore Reserve 1921-22, Flagship 6th LCS Africa 1923-28. Sold February 1931 to Wards; arrived Pembroke Dock 12 March 1931 to be broken up.



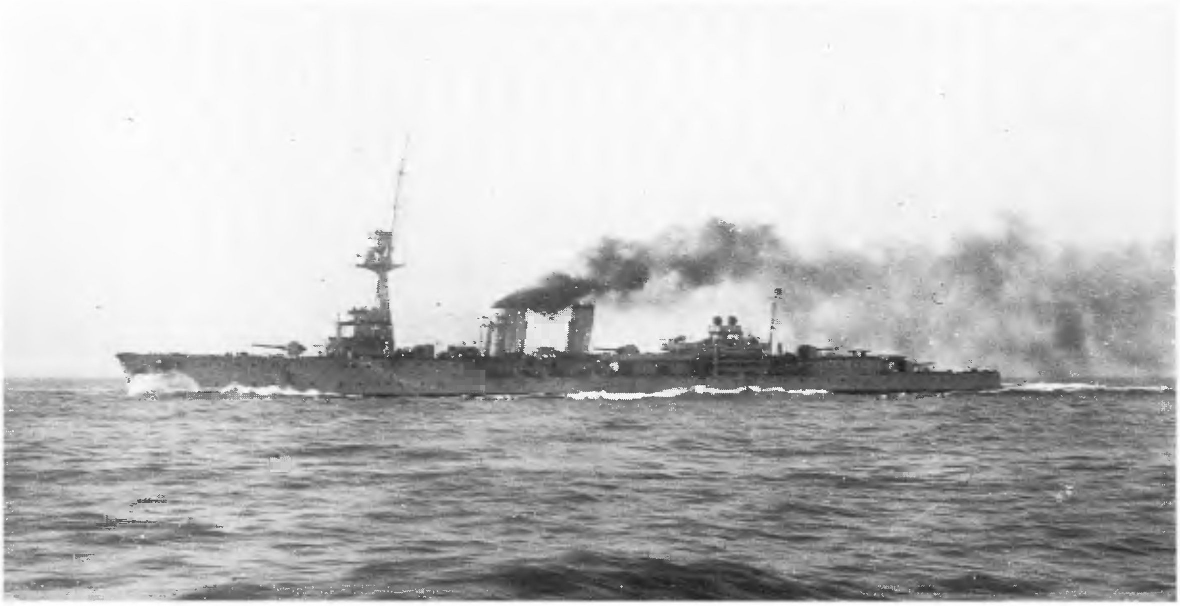
BIRMINGHAM on completion in 1914, in the very dark grey worn by the Home Fleet in the last years before the outbreak of war. Photo : NMM N20601

CENTAUR CONCORD

Great Britain

Yard & No	Laid down	Launched	Final trials	Designer
CENTAUR				
High Walker 888	24 Jan 1915	6 Jan 1916	26 Aug 1916	DNC
CONCORD				
High Walker 889	3 Feb 1915	1 Apr 1916	1 Dec 1916	DNC

Displacement	3828 tons
Dimensions	420 (446 ft 6 in oa) x 41 ft 2 in x 13 ft 6 in [128 (136.1 oa) x 12.5 x 4.1]
Armament	5 x 6 in BL Mk XII, 2 x 3 in HA, 2 x 3 pdr QF. 2 x 21 in TT submerged broadside.
Armour	Side plating 3 in HT steel for about 174 ft amidships from upper deck to 2 ft 6 in below LWL. 2 in - 1 ½ in forward from 4 ft below upper deck to 2 ft 6 in below LWL. 2 in - 1 in aft from 6 ft 6 in below upper deck to 2 ft 6 in below LWL. CT 3 in.
Machinery	4 shaft geared turbines by Vickers. 6 Yarrow boilers. Designed IHP 30,000 = 28 knots.
Fuel	Oil 822 tons.
Complement	348



CENTAUR at speed in the North Sea, early in 1917 Photo : NMM N11689

General

A pair of scout cruisers were ordered by Turkey in May 1914 and given Yard Numbers 877 and 878: they were never laid down, although material was collected.

Displacement	3550 tons (full load about 4300 tons).
Dimensions	400 (423 oa) x 41 x 13 ft 6 in [121.9 (128.9 oa) x 12.49 x 4.11]
Armament	2 x 6 in 50 cal QF, 6 x 4 in 50 cal QF, 2 x 3 in 28 cal QF (anti-balloon and landing guns), 4 x 3 pdr 50 cal QF, 2 x 21 in TT.
Armour	Deck: Nickel steel. 2 ½ in slopes amidships, 1½ in flats and whole deck at end. CT 6 in.
Machinery	3 sets Parsons turbines by Vickers. 11 Yarrow boilers, mixed firing. SHP 24,000 = 27 knots.
Fuel	Coal 150 tons normal, 700 tons maximum. Oil 250 tons maximum.

In January 1915 all work was ordered to be stopped and the assembled materials to be used for other ships. CENTAUR and CONCORD were built on the slips that were to be assigned to the Turkish pair and doubtless some of the material accumulated was used in their building but they bore no resemblance to the Turkish design being developments of the ARETHUSA and CAROLINE Classes. They mounted an all 6 in gun armament on the centre line and were the first light cruiser derivatives of the ARETHUSA Class to mount five of these guns.

Careers

CENTAUR

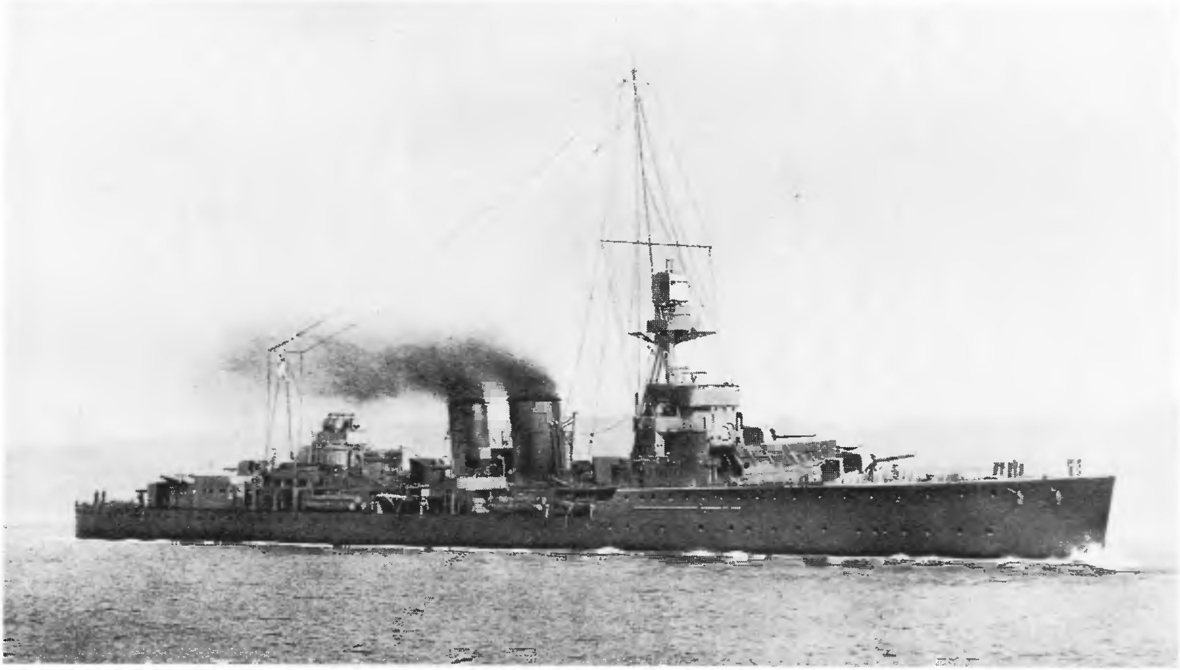
LCS Harwich 1916-19. Baltic 1918-19. 3rd LCS Mediterranean 1919-23. Commodore (D) Atlantic 1925-32. Sold to King, Troon for breaking up in February 1934. Arrived March 1934.

CONCORD

LCS Harwich 1916-19. 3rd LCS Mediterranean 1919-23. 3rd LCS Mediterranean 1924. Attached Australia 1925. China 1925-26. 3rd CS Mediterranean 1926-27. Portsmouth 1928-33. Sold 30 August 1935 to Metal Industries Ltd for £13,075. Arrived at Rosyth 16 September 1935; demolition commenced Charlestown 25 September 1935.

DANAE DELHI DUNEDIN DAEDALUS

Yard & No	Laid down	Launched	Final trials	Designer
DANAE				
High Walker 914	11 Dec 1916	26 Jan 1918	18 Jul 1918	DNC
DELHI				
High Walker 936	29 Oct 1917	23 Aug 1918	20 Jun 1919	DNC
DUNEDIN				
High Walker 938	5 Nov 1917	19 Nov 1918	26 Sep 1919	DNC
DAEDALUS				
High Walker 955	16 Jul 1918	Cancelled Nov 1918		DNC

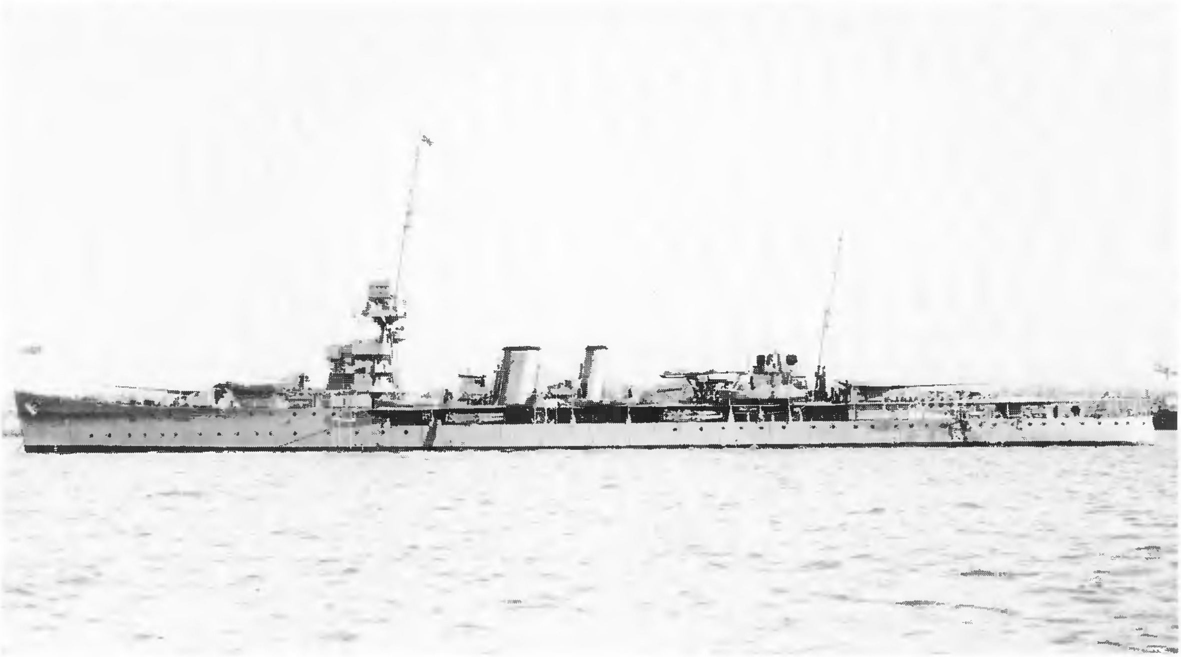


DANAE as completed, c 1919 Photo : Author's collection

Displacement	4720 tons
Dimensions	445 (471 oa) x 45 ft 6 in x 14 ft 3 in [135.6 (143.6) x 14 x 4.3]
Armament	6 x 6 in BL, 2 x 3 in HA, 12 x 21 in TTs in triple mountings on upper deck.
Armour	Side: 3 in HT 160 ft amidships from upper deck to 2 ft 6 in below LWL, forward 2 in - 1½ in from 4 ft below upper deck to 2 ft 6 in below LWL, aft 2 in from 6 ft 6 in below upper deck to 2 ft 6 in below LWL.
Machinery	2 shaft Brown Curtis geared turbines. DANAE and DELHI by Wallsend S & E Co DUNEDIN by Hawthorn Leslie. DAEDALUS by Parsons MST Co. 6 Yarrow boilers. Designed SHP 40,000 = 29 knots.
Fuel	Oil 1050 tons.

General

These ships, part of the twelve DANAE Class four of which were subsequently cancelled, were ordered under the Emergency War Programme, and may be seen as the final development of the ARETHUSA type. All of the six 6 in guns were mounted on the centre line. DANAE was one of the three with no sheer forward. The later "Cs" and "Ds" had a trawler bow with marked sheer and a knuckle to throw off spray to counteract the wetness forward of the earlier "Cs".



DUNEDIN some time during the 1920s, still much as completed. Note her trawler bow, compared to DANAE's level, sheerless forecastle. Photo : MPL

Careers

DANAE

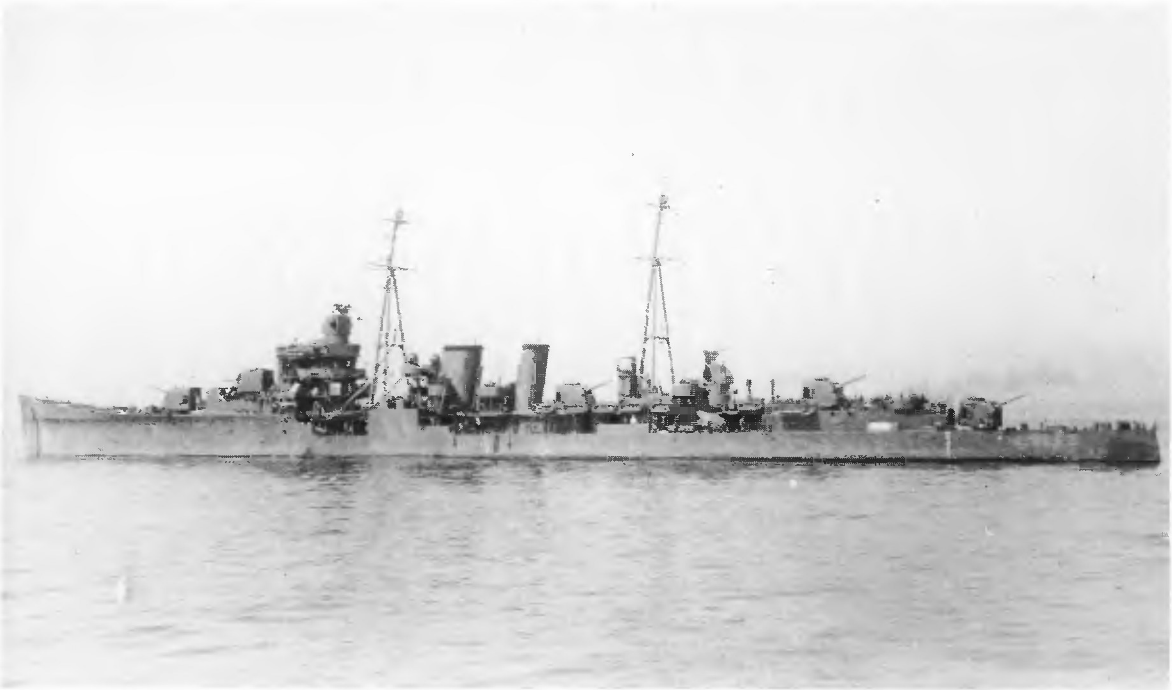
World War One; 5th LCS Harwich 1918-19. Post-war: Atlantic, Empire Cruise 1923-24, Mediterranean, America and West Indies. In reserve 1935-39. World War Two; Atlantic 1939, China 1942-44; lent to Polish Navy and renamed CONRAD. Took part in Normandy bombardment. Sold 22 January 1948; arrived 27 March 1948 at Wards, Barrow for breaking up.

DELHI

Flagship 1st LCS. Atlantic Squadron, Empire cruise 1923-24; Mediterranean, American and West Indies; Mediterranean. In reserve 1938-39. World War Two; Home Fleet, South Atlantic. In 1941 refitted at New York and converted to an AA ship with US naval main armament of 5 in DP. 1942 Home Fleet, 1943-45 Mediterranean. Damaged by an explosive motor boat off Split 12 February 1945. Arrived May 1948 to be scrapped by Cashmores, Newport.

DUNEDIN

1919-24 Atlantic. 1924-37 New Zealand Division. World War Two: Home, American and West Indies, South Atlantic. 24 November 1941 torpedoed and sunk by U124 north of Pernambuco.



DELHI in July 1943, rearmed with 5 x 5 in DP guns in enclosed gunhouses. Photo : MPL

EMERALD
Great Britain

Yard & No	Laid down	Launched	Designer
High Walker 956	23 Sep 1918	19 May 1920 Towed away unfinished Oct 1920 Completed Chatham1925. Final Trials 14 Jan 1926	DNC

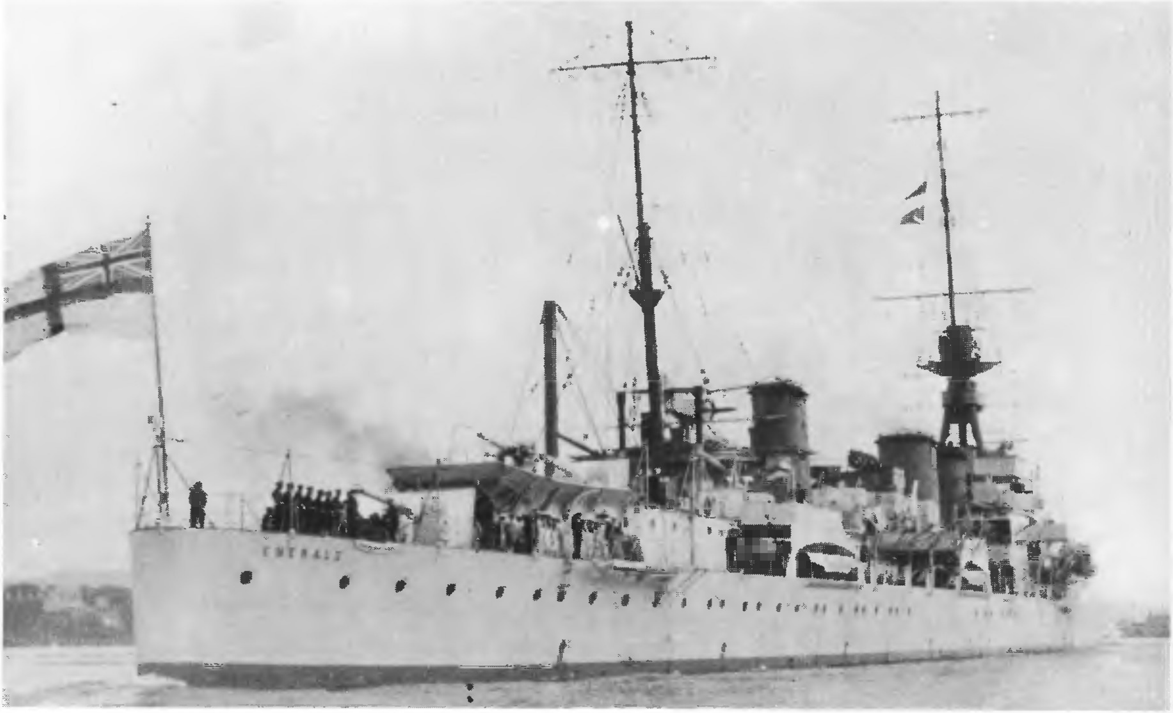
Displacement	7550 tons
Dimensions	535 (570 oa 565 wl) x 54 x 16 ft 6 in [163.1 (173.7 oa 172.2 wl) x 16.46 x 5.03]
Armament	7 x 6 in BL, 2 x 4 in HA, 2 x 2 pdr pom-pom, 12 x 21 in TT in four triple mountings.
Armour	Side 2 in-1 in HT from 2 ft 6 in below LWL to upper deck for about 276 ft amidships. 1 ½ in forward for about 165 ft from 2 ft 6 in below LWL to 10 ft 6 in above. 1 in aft.
Machinery	4 shaft Brown Curtis geared turbines by Wallsend S & E Co. 8 Yarrow boilers. Designed SHP 80,000 = 33 knots. Trials 80,450 SHP = 32.83 knots.
Fuel	Oil. 1746 tons.
Complement	556

General

Built under the War Emergency Programme to counter the fast German cruisers that were thought - incorrectly - to be under construction. The design was shaped by the requirement for 32 knots at deep load. As two of the 6 in guns were sided, her six gun broadside was no greater than the Ds.

Career

1926-33 East Indies, temporarily attached to China squadron. 1934-37 East Indies. 1937-39 in reserve. World War Two: 1939-40 Atlantic, East Indies 1941-42, Eastern Fleet 1942; June 1944 Normandy Landings. Sold 23 July 1948 and broken up at Troon.



EMERALD in 1926, in East Indies white and buff livery soon after completion, with short funnels, mainmast abaft her third funnel, and with a circular flying-off platform. In a refit in 1935-36 she was fitted with a catapult in place of the platform, requiring the mainmast to be moved forward of her third funnel, and all three funnels were raised by 5 feet. Photo : MPL

CHAPTER 8

MISCELLANEOUS: COAST DEFENCE SHIPS, SMALL CRUISERS, TRAINING SHIPS, REVENUE CRUISERS, CONVOY SLOOPS

COAST DEFENCE SHIPS

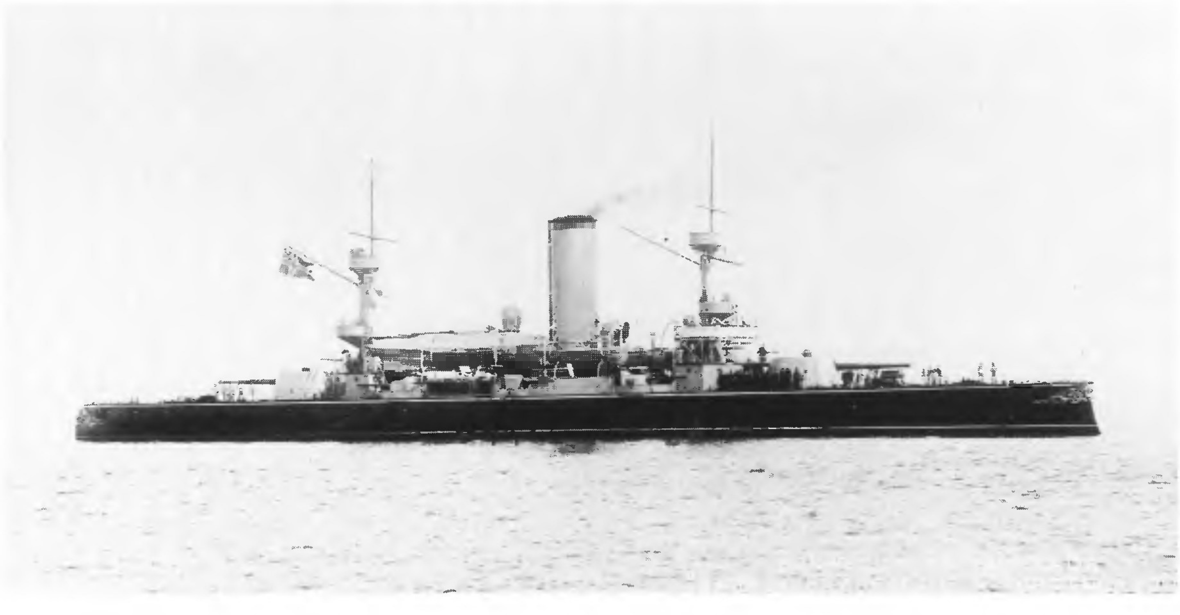
Purpose built Coast Defence Ships (CDS), although built by major powers, were particularly suitable for smaller navies with long coastlines or scattered possessions to defend and for operating in enclosed waters, such as the Baltic. They ranged in size from 150 ton monitors to the 7000 ton SVERIGE class of the Swedish Navy. In order to keep displacement, and thus draft of water and cost, to a minimum, seagoing capability, particularly freeboard, speed and endurance, were sacrificed while a powerful armament and armour were preserved as far as possible.

One distinguished naval architect, William Hovgaard, identified Norway's strategical conditions as being the defence of important fiords and a general defence of the long coast to prevent blockade and to protect communications between different parts of the country. Ideally this required ships of almost full seagoing capacity, mounting large calibre guns, whilst endurance could be sacrificed. However, financial considerations resulted in ships which were far from approaching these ideal requirements.

HARALD HAARFAGRE TORDENSKJOLD

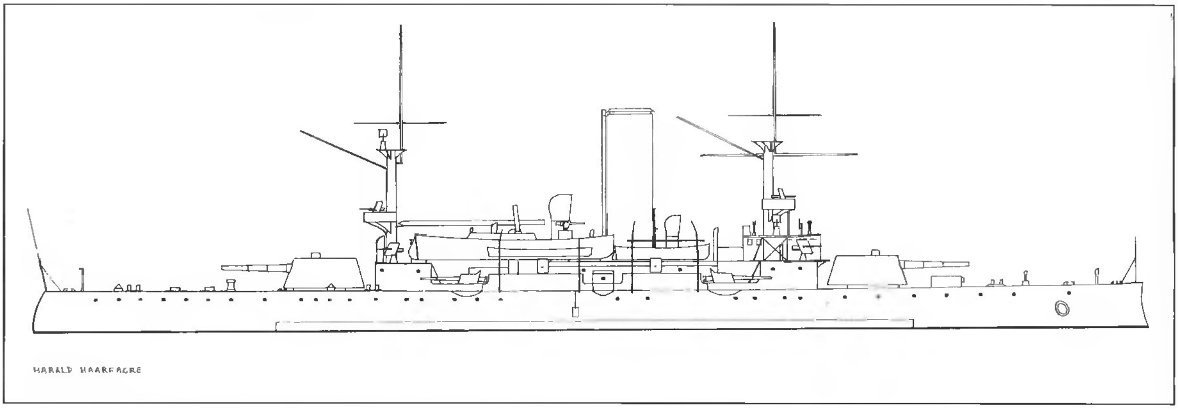
Norway

Yard & No	Laid down	Launched	Final trials	Designer
HARALD HAARFAGRE				
Low Walker 648	18 Mar 1896	4 Jan 1897	10 Jun 1897	Phillip Watts
TORDENSKJOLD				
Low Walker 649	18 Mar 1896	10 Mar 1897	2 Apr 1898	Phillip Watts



HARALD HAARFAGRE off the Tyne newly accepted by the Royal Norwegian Navy, in full Victorian colours, June 1897 Photo : UNT

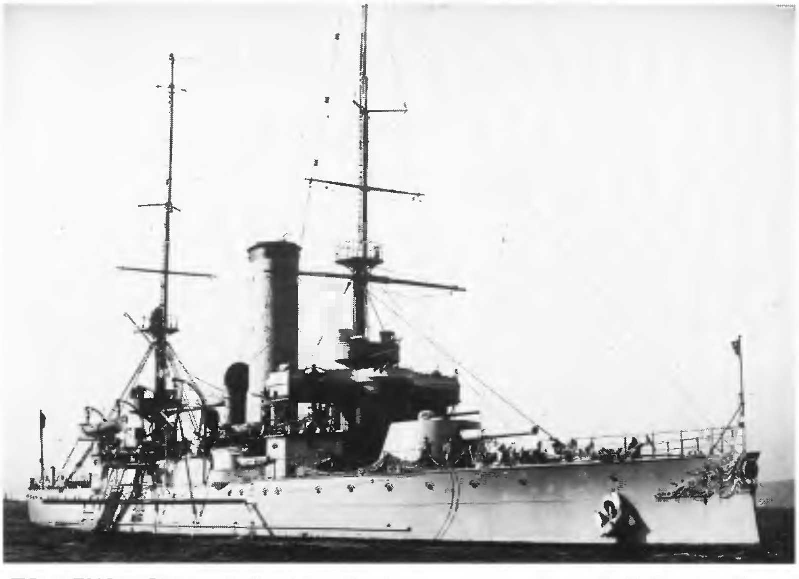
Displacement	3435 tons
Dimensions	280 (304 oa) x 48 ft 6 in x 16 ft 7 in [85.34 (92.7 oa) x 14.8 x 5.03]
Armament	2 x 8.2 in (21 cm) 45 cal BL, 6 x 4.7 in (12 cm) 45 cal QF, 6 x 12 pdr QF, 6 x 1½ pdr QF, 2 x 18 in TT submerged broadside.
Armour	Harvey Nickel. Belt 7 in. Bulkheads 7 in. Barbettes and gunhouses 8 in - 5 in. CT 6 in. Deck 2 in.
Machinery	2 sets VTE by R & W Hawthorn Leslie. 3 cylindrical boilers. Designed IHP ND 4500 = 16 knots. Trials (TORDENSKJOLD) IHP 4750 = 17.143 knots.
Fuel	Coal. 200 tons normal, 553 tons maximum.
Complement	225



HARALD HAARFAGRE and TORDENSKJOLD, 1898

General

In 1895 the only armoured ships of the Royal Norwegian Navy were four obsolete monitors, but because of tension with Sweden about Norway's increasing dissatisfaction with the 80 year old union with that country (which was dissolved peacefully in 1905) money was provided for the laying down of four CDS. Although Sweden had a ship building industry which had produced some very satisfactory CDS political reasons made it undesirable for Norway to use these.



TORDENSKJOLD c.1910, with tall w/t topmasts and now in light grey livery.
Photo : IWM

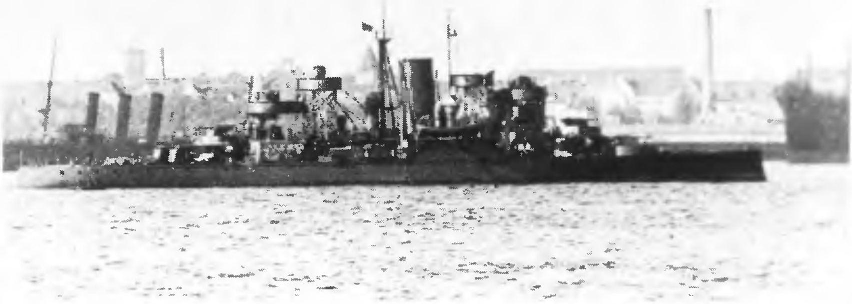
When the Storting (the Norwegian parliament) voted to build four CDS Norway turned to Armstrongs for them.

In November 1895 Armstrongs submitted a tender to Norway for two small warships of 3500 tons each. In January 1896 Norway accepted the tender and in March a decision was made to build the pair at Low Walker, then short of orders for merchant ships.

The heavy guns fired a 309 lb shell and were mounted in single oval turrets fore and aft: each contained 50 shells with another 100 for each gun in the shell rooms below. The 4.7 in guns were RP2000 shield protected and there were only two ammunition hoists for all six, these being mounted in the rear of the forward guns. Originally only four 4.7 in were to be mounted but two were added while building.

Careers

All four CDSs were mobilised in 1905 during the independence crisis to patrol the Skaggerak. TORDENSKJOLD was employed as a cadet training ship in the latter 1920's and early 1930's. Her forebridge was greatly enlarged, enclosing and replacing the fighting top on the foremast; her maintop was removed at the same time. Both ships had 2 x 3 pdr AA guns added in about 1930. They were disarmed in the autumn of 1939 after Norwegian neutrality defence measures came into effect. and then served as accommodation ships in Horten harbour. In April 1940 they were taken over by the German Navy for use as floating antiaircraft batteries and armed with 6 x 10.5 cm AA, 2 x 40 mm AA and 14 x 20 mm AA guns.



TORDENSKJOLD as the German 'swimmende flakbatterie' NYMPHE about 1943
Photo : ROM collection

HAARFAGRE was renamed THETIS. From 1943 - 1944 she served as a listening post for the German battleship TIRPITZ lying in Kaafiord. At the end of the war she was returned to the RNN and used as a floating barracks until 1947 when she was sold for scrapping.

TORDENSKJOLD was renamed NYMPHE and formed marine anti-aircraft detachment 241. On 17 May 1945, just over a week after the war ended, her German crew ran her aground at Helleford farm after being ordered to return her to RNN control at Narvik; the wreck was refloated and sold for scrapping in 1948.

NORGE EIDSVOLD

Norway

Design History

Phillip Watts and Saxton Noble visited Norway in the winter of 1898/99, and in January 1899 an order was placed for two armourclads of 3,850 tons. A range of designs for an "Improved HARALD HAARFAGRE" were drawn up and offered to Norway. The common features were:

Dimensions	3435 tons, 280 x 48½ x 16 1/2 feet.
Armour	6 in Harveyed belt, 170 ft long, 6½ feet deep. Main armament barbettes 6 in, gunhouses 8 in fronts, 5 in backs. Conning Tower 6 in, Deck 2 in.

Design A:
Generally similar to HARALD HAARFARGE, with 2 x 8.2 in guns in sloping-sided gunhouses fore and aft, but with secondary armament of 4. x 5.9 in guns in shields on the upper deck, plus 10 x 12 pdr, four on the shelter deck, four on the upper deck and two in the hammock racks. 6 x 3 pdrs, four carried in the tops, two on the bridges. Two 18 in submerged torpedo tubes.

Design B:
Substituted six 4.7 for the four 5.9 in guns, but was otherwise the same as A.

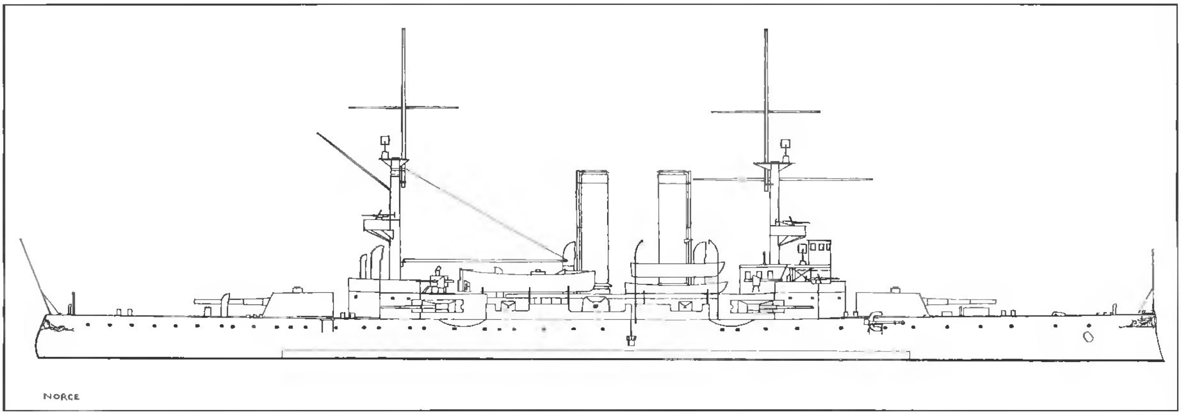
Design C:
Had the six 4.7 in guns in a 3 in citadel, and carried only eight 12 pdrs instead of 10. Displacement would be 3,730 tons.

Design D:
As A, except that the main armament was 2 x 9.4 in instead of 8.2 in. Displacement would be 3,483 tons.

Design E:
Had D's main armament of 9.4 in guns, and had a secondary armament of four 5.9 in casemates, with 5 in fronts, 2 in backs, and 1 in floors. Displacement would be 3,690 tons.

Design F:
Reverted to 8.2 in guns for main armament, secondary armament of six 5.9 in, four in casemates, and with one in a shield between the casemates on each side. Displacement in this case was stated as 3,630 tons.

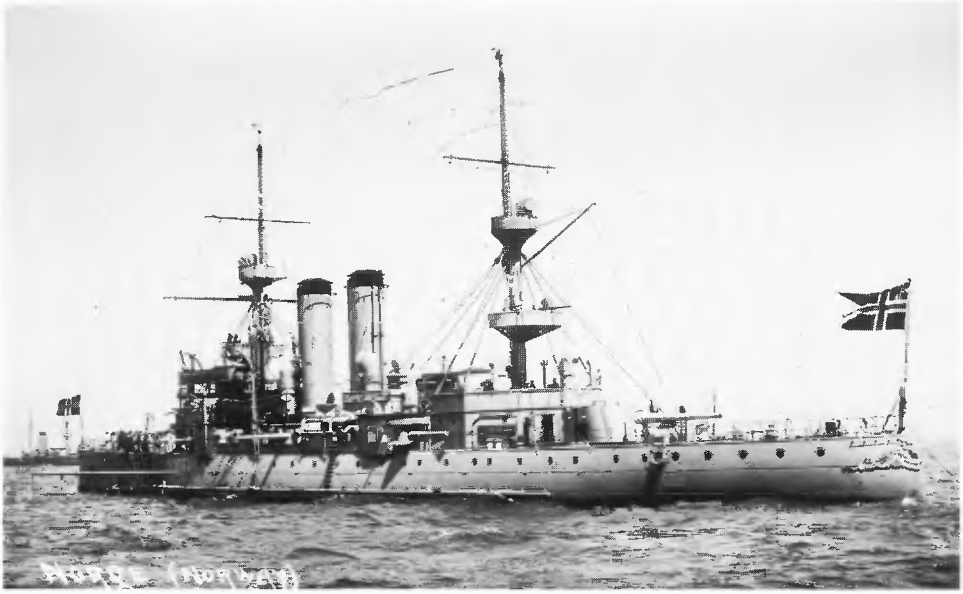
The final design was a modified F, with all six 5.9 in in casemates and a displacement of 3,760 tons, though as built the centre guns were behind shields.



NORGE and EIDSVOLD 1901

Yard & No	Laid down	Launched	Final trials	Designer
NORGE				
Elswick 698	14 Apr 1899	31 Mar 1900	7 Feb 1901	Phillip Watts
EIDSVOLD				
Elswick 699	9 May 1899	14 Jun 1900	5 Mar 1901	Phillip Watts

Displacement	3848 tons. 3715 tons on trial.
Dimensions	390 (310 oa) x 50 ft 6 in x 16 ft 6 in [88.4 (94.6 oa) x 15.4 x 5]
Armament	2 x 8.2 in (21 cm) 45 cal BL, 6 x 5.9 in (15 cm) 45 cal BL, 8 - 12 pdr QF, 6 x 3 pdr QF, 2 x 18 in TT submerged broadside.
Armour	Krupp. Belt 6 in between fore and aft barbettes. 8 in gunhouses; bases 6 in. Casemates 5 in. CT 8 in.
Machinery	2 sets VTE by R & W Hawthorn Leslie. 6 Yarrow wt boilers. Designed IHP ND 4500 = 16.5 knots. Trials, NORGE IHP 5354 = 17.06 knots.
Fuel	Coal. 250 tons normal, 583 tons maximum.
Complement	261



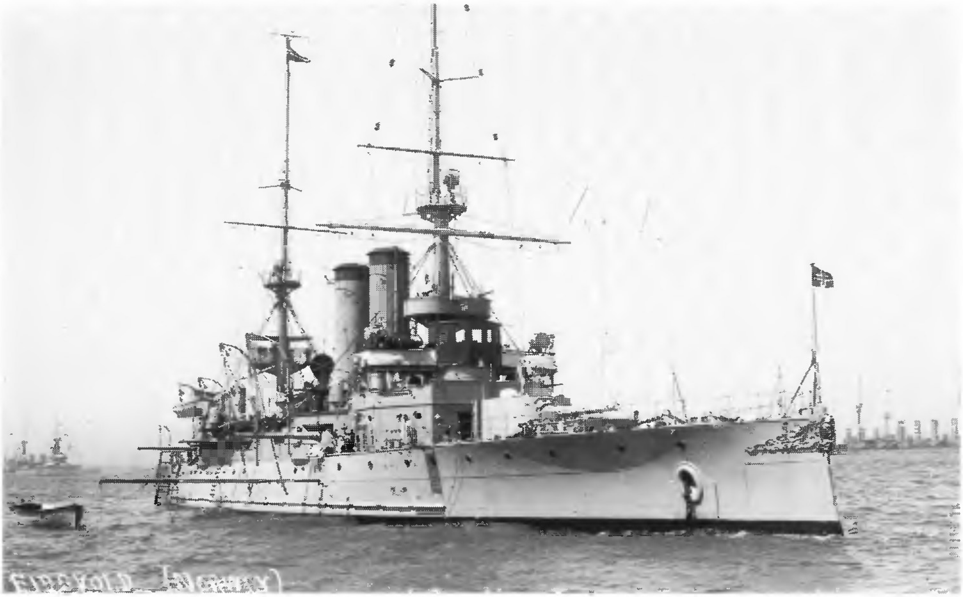
NORGE at King Edward VII's Coronation Review at Spithead, June 1902, still as completed only a year ago. Photo : NMM GEC-1

General

They were immediately distinguishable from the earlier pair as the uptakes from their six Yarrow boilers were led to two slimmer and smaller funnels than HARALD HAARFAGRE's single one. Both had two 12 pdrs replaced by 76 mm AA guns about 1930. Later their AA armament was further augmented by 2 x 20 mm Oerlikons and six machine guns. Otherwise they were little altered up to their loss.

Careers

NORGE attended the Coronation Review of 1902 and EIDSVOLD that of 1911. Their lives were uneventful until 1940



EIDSVOLD at the Coronation Review of 1911. She now has tall w/t topmasts, her after military top has a roof for the fire control gear, and both tops have indicator dials. The 3 pdrs from the main top are now mounted on top of the 8.2 in turrets. Photo : NMM GEB-1

At the time of the German invasion of Norway in April 1940, both were serving as guardships in Ofotfiord. In the early morning of 9 April 1940 they were alerted by guard boats to the presence of destroyers coming up the fiord. EIDSVOLD sortied to meet them, leaving NORGE lying at Narvik pier so as to be in telephone communication with the shore. Because of the thick weather, and the possibility that the destroyers were British (a message had just been received that they should not fire on any Royal Navy ship) both then put out to sea. The destroyers were in fact German, and EIDSVOLD fired a warning shot. One German destroyer, WILHELM HEIDKAMP, sent a small boat, ostensibly to parley, but in fact to demand EIDSVOLD's surrender. The commanding officer Captain Willoch refused, and sent the German boat away, but did not open fire, the convention being that hostilities should not open until the pourparler representatives had reported back to their principals. The boat, as soon as it left EIDSVOLD, made a prearranged illicit signal to HEIDKAMP, which then fired a salvo of torpedoes at close range, some 100 to 300 yards. EIDSVOLD was hit by three torpedoes and blew up; only six of her crew were saved. The NORGE opened fire at about the same time on two German destroyers, having first issued a challenge and then fired a warning shot. She got away 17 rounds before being hit by two torpedoes fired by BERND VON ARNIM and quickly sank, but 90 men were saved. The justification offered by General Dietl, overall force commander, for HEIDKAMP's act of treachery, was that the 35 knot destroyer was in danger of being rammed by her 40 year old opponent.

GLATTON GORGON

(ex BJOERGVIN) (ex NIDAROS)

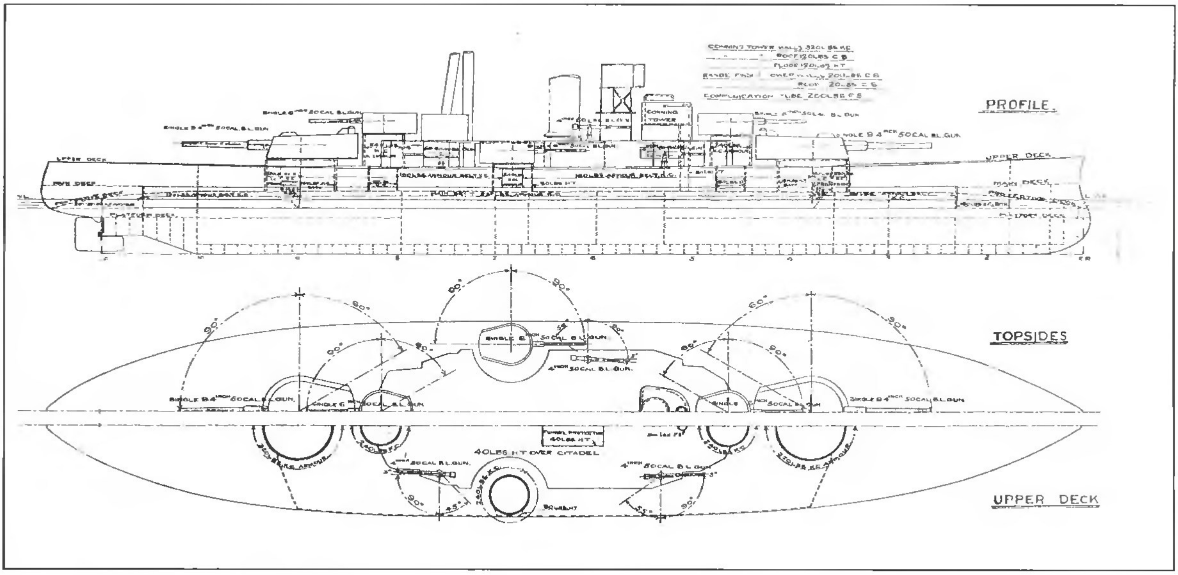
Great Britain

Design History

Enquiries were received from Norway in 1911 for another pair of coast defence ships, and Tennyson-D'Eyncourt prepared four alternative sketch designs.

Design No	715	716	717	718
Displacement (tons)	5,000	5,500	6,000	4,000
Length pp (feet)	290	320	320	250
Beam	51 1/2	57	62	57
Draught	16 1/2	17	18 1/2	17
Armament	2 x 9.4 in 6 x 5.9 in 4 x 3.9 in	4 x 9.4 in 6 x 5.9 in 4 x 3.9 in	2 x 12 in 6 x 5.9 in 4 x 3.9 in	4 x 9.4 in 4 x 5.9 in 2 x 12 pdr
Speed (knots)	16.5	16.5	17.0	14.5

Designs 716 and 717 were too large to dock in the Horten Naval Yard, and the ships as built were based on 715. The contract for the pair was signed in November 1913. After the outbreak of World War One work on them was slowed, and then stopped as priority was given to the British ships building at Elswick and Walker.


PROFILE.
UPPER DECK
MAIN DECK
SINGLE 9.4 INCH 50 CAL. B.L. GUN
COMMUNICATION TUBE 200LBS C.S.
TOPSIDES
SINGLE 6 INCH 50 CAL. B.L. GUN
40LBS H.T. OVER CITADEL
90°
60°
45°
UPPER DECK

Armstrongs design for BJOERGVIN and NIDAROS, 1913

Yard & No	Laid down	Launched	Final trials	Designer
GLATTON				
Elswick 861	26 May 1913	9 Jun 1914	8 Sep 1918	J R Perrett
GORGON				
Elswick 86211	June 1913	8 Aug 1914	25 May 1918	(modified by Tennyson d'Eyncourt as DNC)

	As Designed	As Completed
Displacement	4900 tons	5700 tons (5746 tons deep loaded).
Dimensions	290 x 55 x 16 ft 6 in [88.4 x 16.76 x 5.03]	290 (310 oa) x 73 ft 8 in (over bulges) x 16 ft 4 in [88.4 (94.5 oa) x 22.55 x 4.98].
Armament	2 x 9.45 in (24 cm) 50 cal BL 4 x 5.9 in (15 cm) 50 cal BL 6 x 3.9 in (10 cm) 45 cal BL 2 x 18 in TT submerged broadside	2 x 9.2 Mk XII 51.35 cal 4 x 6 in Mk XVIII 48.92 cal 2 x 3 in AA 4 x 3 pdr AA, 2 x 2 pdr pompom in GLATTON 4 x 2 pdr pompom in GORGON

Armour as designed Belt 7 in amidships, 4 in forward, 3 in aft, side above belt between main turrets 4 in. Bulkheads 4 in. Deck: slopes 2 in, flat 1 in.
Turrets: main, 8 in, small, 6 in. CT's; fore 8 in, aft 6 in.
modifications as built : Side above belt increased to 6 in abreast of small wing turrets.
Deck increased to 2 - 2½ in fore and aft of barbettes
Main turrets sides and rear reduced to 6 in, roof and floors 3 in
Small turrets roof 2 in, floors 1½ in. CT roof 3 in. Steering gear 3½ in - 5 in

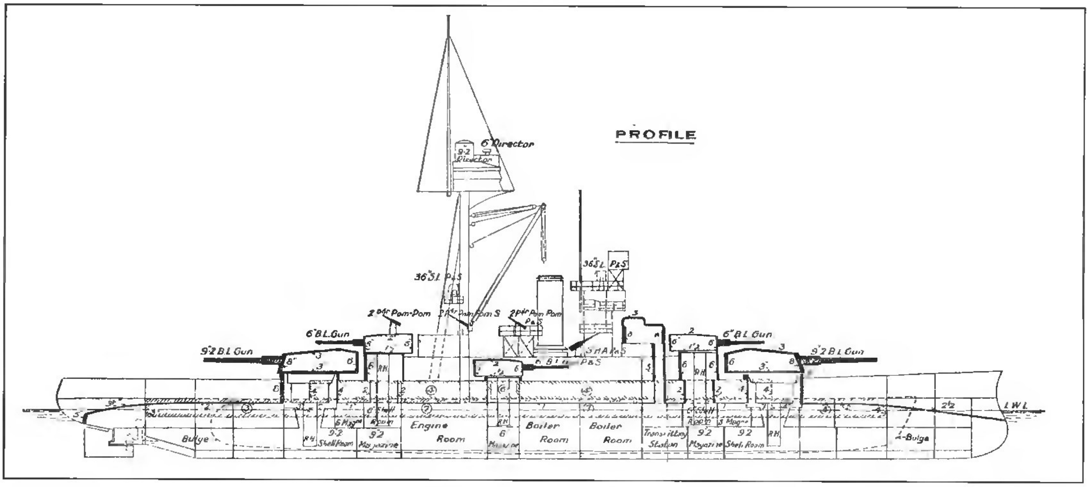
Machinery Two sets triple expansion by R & W Hawthorn Leslie. Four Yarrow boilers - mixed firing.
Designed IHP 4000 = 15 knots. On completion, speed on 6 hr trial about 13 knots.

Fuel 364 tons coal. 170 tons oil

Complement as designed 251, as completed 22/283

General

In November 1914 Churchill and Fisher arranged for them to be taken over for the Royal Navy, to be used for shore bombardment, with the money so far paid by the Norwegian government (£246,000 of a total of £375,000 each) being refunded. The order to Armstrongs to restart work was sent off 9 January 1915, and their British names allocated in April, but when Churchill and Fisher left the Admiralty in the following month work was suspended again. In September 1917 work was restarted to a revised design, in which the main armament was given 40 degrees of elevation, while the 3.9 in guns in the superstructure were removed to provide more accommodation,



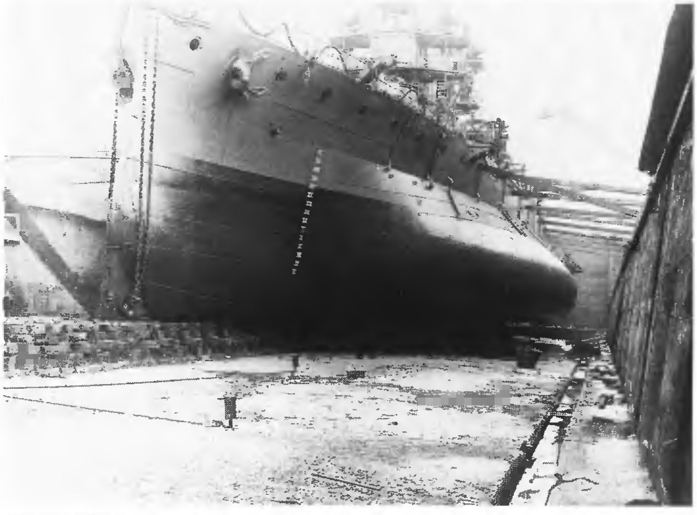
GLATTON and GORGON as modified for RN service, from plans in the NMM

being replaced by two 3 in AA and other light anti-aircraft artillery. A large tripod mast was fitted with a heavy director and spotter top. Bulges were fitted, increasing the beam by 23 feet and reducing the speed by 2 knots. Both main and secondary armament had to be altered to standard British calibres, the 9.4 in being relined to 9.2 in, and 5.9 in to 6 in. With special ammunition the 9.2 in guns now had the remarkable range of 39,000 yards, at a rate of fire of 2 rounds per minute.

Careers

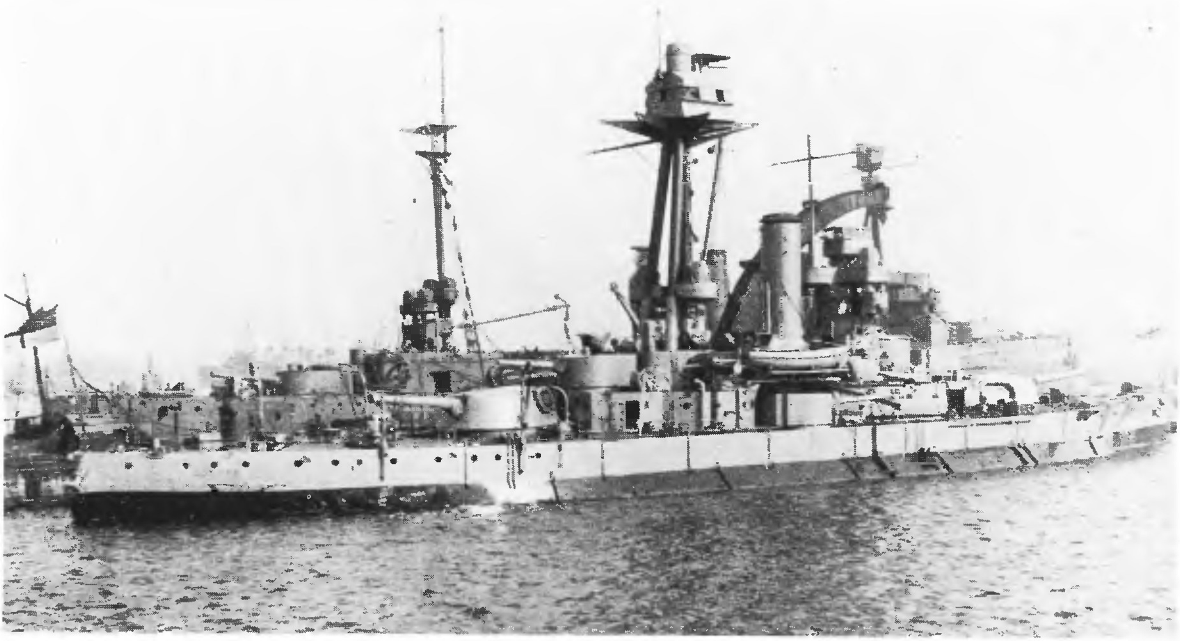
GLATTON

She joined the Dover Patrol on 11 September 1918. Five days later Admiral Keyes, with GLATTON's CO, Commander N W Diggle, were walking on the cliffs above Dover when they heard a huge explosion and saw a cloud of smoke rising from GLATTON, which had blown up and was burning furiously. Her forward magazines were flooded, but the fires prevented flooding the after magazines which might go up at any minute. Berthed close to her was an ammunition ship, and Keyes decided that, to avoid further explosions setting off the ammunition carrier and devastating the town GLATTON should be sunk, once all the crew had been evacuated. He boarded the destroyer MYNGS and ordered a torpedo to be fired at her. This failed to explode, as the safety fan was not wound off. A second torpedo, its fan run off before firing, exploded, but was not enough to penetrate the hull behind the bulge. After a third torpedo GLATTON rolled over and sank. Sixty of her crew were missing and 124 injured, of whom 19 later died of burns.



GLATTON in dry dock during completion, showing bulges and the chains and pierced forefoot for paravanes Photo : IWM SP2083

The enquiry into her loss established that the explosion started in the midships 6 in magazines, immediately aft of No 2 boiler room. Stokers habitually piled red hot cinders against the separating bulkhead before sending them up the ejector, and it was concluded that the cork in the lagging of the bulkhead must have slowly overheated and burnt. GORGON was subject to a careful examination, and it was found that the cork was missing in places, and in its place air or even rolled-up newspapers. Rivets had also been omitted, and air from the forced draught in the boiler room may well have fanned heated paper into flame through the rivet holes. GLATTON's hulk remained on the bed of Dover harbour until it was lifted and scrapped in March 1926.



GORGON alongside in Devonport, probably in 1920 Photo : IWM SP57

GORGON

She arrived to join Keyes' Dover Patrol on 6 June 1918, and fired her first rounds against a German howitzer battery on 26 July. She was in action regularly through September and October, receiving no more than splinter damage from near misses, and on one occasion beating a hasty retreat at 14 knots, two knots more than she made on trials. On 15 October she fired the last shots of the war at the Belgian coast, the German withdrawal removing the need for further operations. After GLATTON's explosion comprehensive trials were conducted on GORGON to determine the cause of the disaster, which were only completed early in 1919.

After the war she was offered back to Norway, but she was now too beamy to use the Horten dock, and was rejected. She was put on the sales list, and enquiries were received from South American countries and what at one time seemed a firm offer from Romania, but no sale took place. In 1921 her armament was removed, and she was used for tests to study the effects of bombs or heavy charges bursting under water. These and other experiments continued until 1928, when she was sold for scrapping on 28 August to Wards, Pembroke Dock.

SMALL CRUISERS

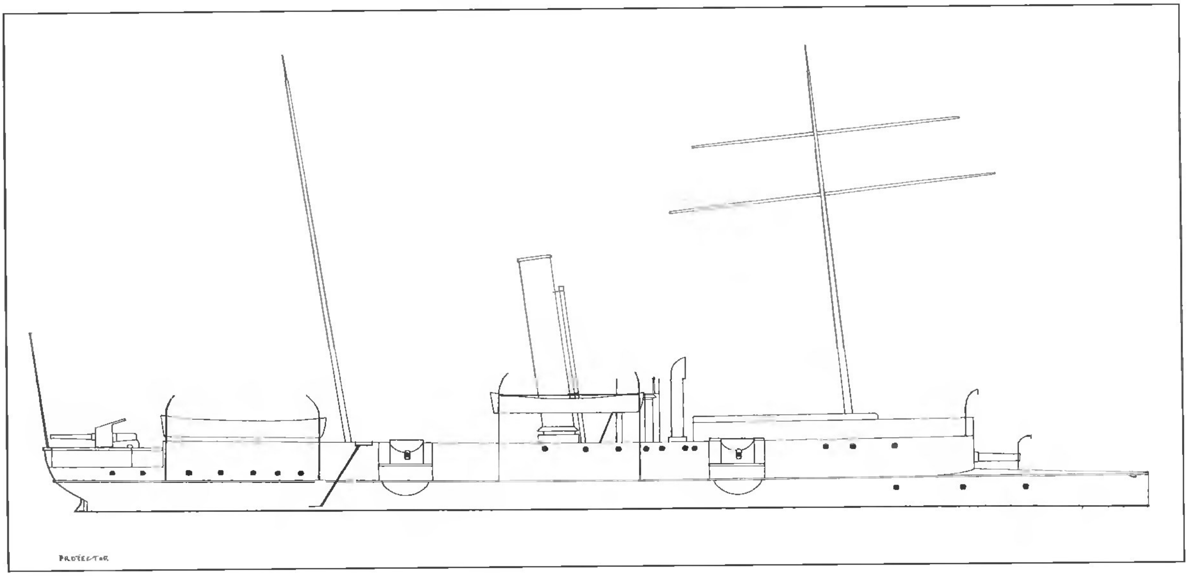
I have classified two ships, PROTECTOR and TIRADENTES, both of limited displacement and not fitting easily into any class, as 'small cruisers'.

PROTECTOR

South Australia: later Royal Australian Navy

Yard & No	Laid down	Launched	Final trials	Designer
Low Walker 457	8 Dec 1882	27 Dec 1883	19 Jun 1884	G W Rendel

Displacement	921 tons.
Dimensions	80 ft 6 in (185 oa) x 30 x 12 ft 6 in [55 (65.3 oa) x 9.1 x 3.8]
Armament	1 x 8 in 12 ton BL, 5 x 6 in 5 ton BL, 4 mg - later replaced by 4 x 3 pdr QF
Armour	1 in strake of armour at waterline. CT 1 in. 1 in breastwork. 2 in gun shields. Steel deck covering machinery added circa 1890.
Machinery	2 sets horizontal direct acting compound engines by R & W Hawthorn. Cylindrical boilers. Designed IHP 1500=14 knots. Trials IHP ND 1645=14.15 knots.
Fuel	Coal. 150 tons normal, 175 tons maximum.
Complement	90 - 100

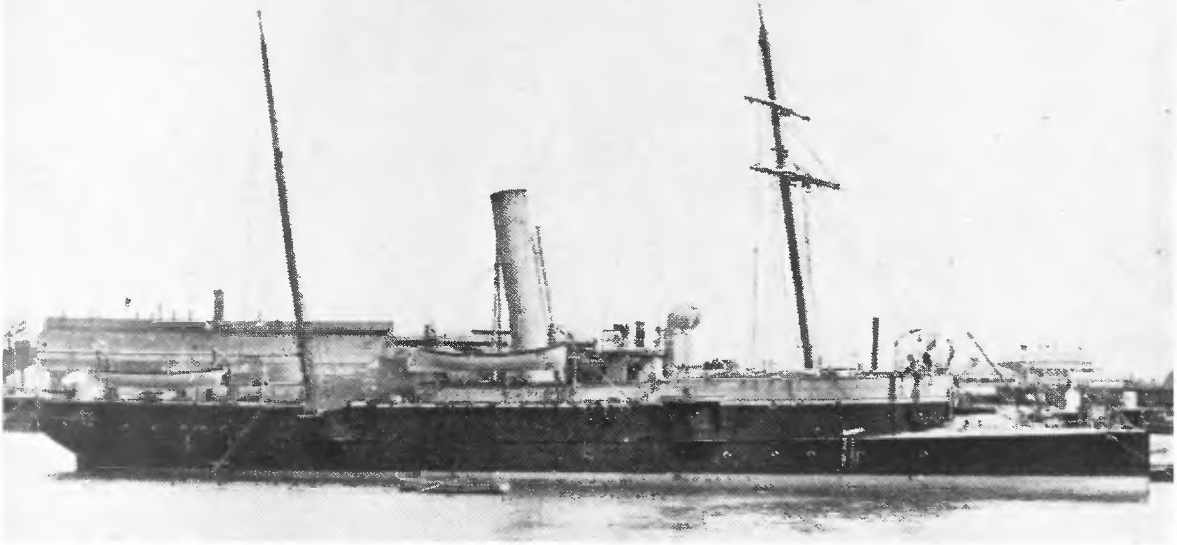


PROTECTOR 1884

General

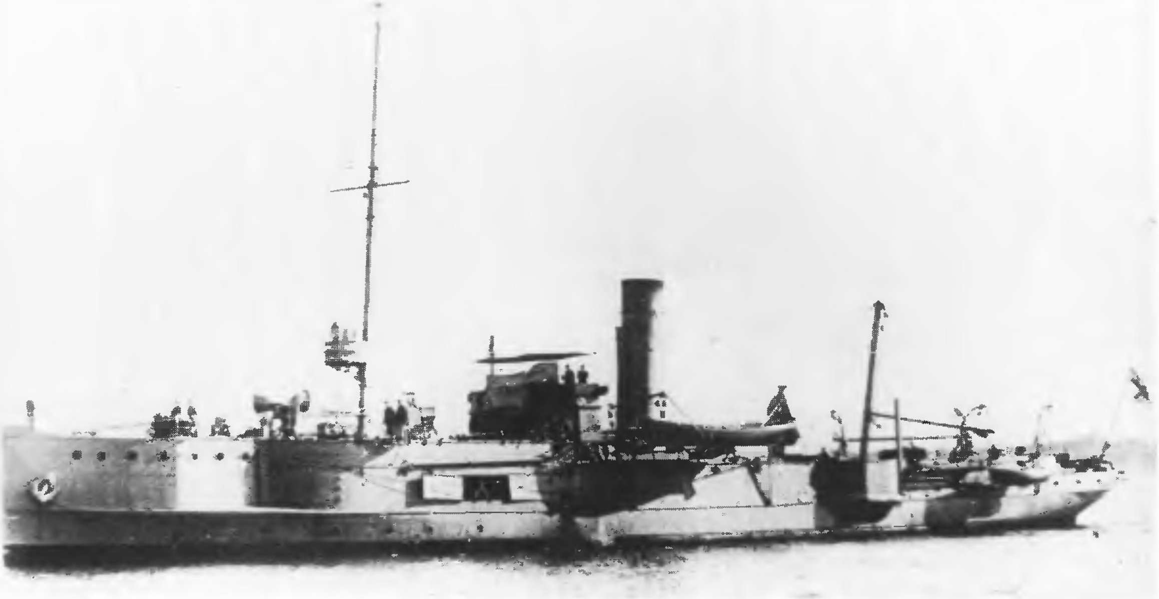
Built for the government of South Australia based on design F1 in the series submitted to New South Wales (Table 2/2), PROTECTOR was a much enlarged development of the Rendel flat-iron gunboat type. She carried one 8 in firing ahead through bulwarks over a low bow, with five 6 in guns, two on each beam and one aft. With only light vertical armour when built, in 1889 Elswick built a splinter deck to cover her machinery spaces which was shipped out to Adelaide and fitted locally. She was given a light brigantine rig for her passage out to Australia which was soon reduced to bare poles.

She was classified as a cruiser by her owners. She was transferred to the Royal Australian Navy in 1911 and in 1912 she was stripped of her old armament, which had become useless because ammunition was no longer available. She had her bow built up and was rearmed with 3 x 4 in QF, 2 x 12 pdr QF and 4 x 3 pdr QF. She was then classed as a gunboat.



PROTECTOR rigged for the passage out to Australia, June 1884 Photo : ROM collection

Career
Employed on arrival in South Australia as a guard-ship for Port Phillip, her service until 1900 consisted mainly of short training exercises. In 1900 she was offered to the British Government to help in the suppression of the Boxer rebellion in China. Unescorted she made the long passage from Adelaide to Taku without breakdowns or defects. She was used to carry despatches and received universal acclaim for her efficiency. She returned to Adelaide on 7 January 1901, having been away since 6 August 1900. The impression she made on the Imperial forces in China was a significant factor in the acceptance by the Admiralty of the Dominion's wish to form its own navy in 1911.



PROTECTOR in 1918, in her final state with bow built up and reduced armament
Photo courtesy of Graeme Andrews

After her rebuilding she was used for seaman training. At the beginning of World War One she became tender to the RAN submarines AE1 and AE2 at Port Jackson. In September and October 1914 she took part in the capture of Samoa from the Germans, taking prize a small German merchant ship in the process. In 1915 she visited the Cocos and Keeling islands to check on the wreck of SMS EMDEN, following rumours that a Japanese firm intended to salvage it, but found that it was far too broken up to warrant recovery.

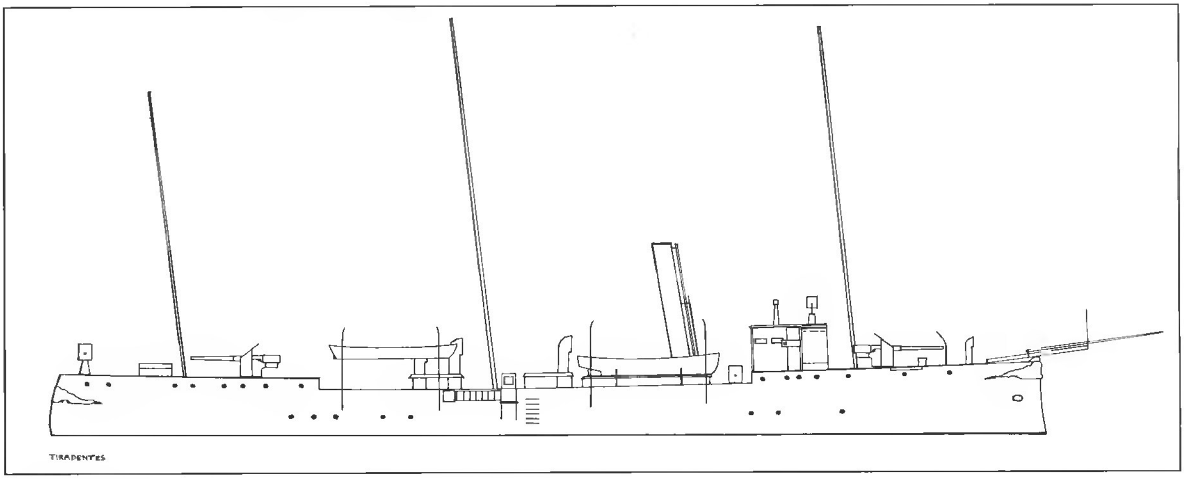
Post-war she became tender to HMAS CERBERUS at Flinders, taking that name until she was sold out of service in 1924. By 1924 she had been hulked, was renamed SIDNEY in 1931, and until World War Two was used as a lighter carrying wool between Geelong and Brisbane. In 1943 she was requisitioned by the US army, but while on tow to New Guinea broke the tow and was then damaged in an attempt to reconnect it. She was beached in shallow water off Heron Island, Queensland in order to form a breakwater and her wreck can be seen to this day.

TIRADENTES

Brazil

Yard & No	Laid down	Launched	Final trials	Designer
Elswick 588	July 1891	26 May 1892	14 Sep 1892	Phillip Watts

Displacement	728 tons on trial
Dimensions	165 (173 oa) x 30 x 10 ft 9 in [50.3 (52.73 oa) x 9.1 x 3.3] Freeboard amidships 4 ft 9 in.
Armament	4 x 4.7 in QF, 3 x 6 in pdr QF, 4 mg, 2 x 14 in TT.
Armour	3/8 in splinter deck. 2 in CT.
Machinery	2 sets VTE by R & W Hawthorn Leslie. Trials IHP ND 1126 = 12.923 knots (designed FD = 14.5 knots).
Fuel	Coal. 60 tons normal, 144 tons maximum.
Complement	110

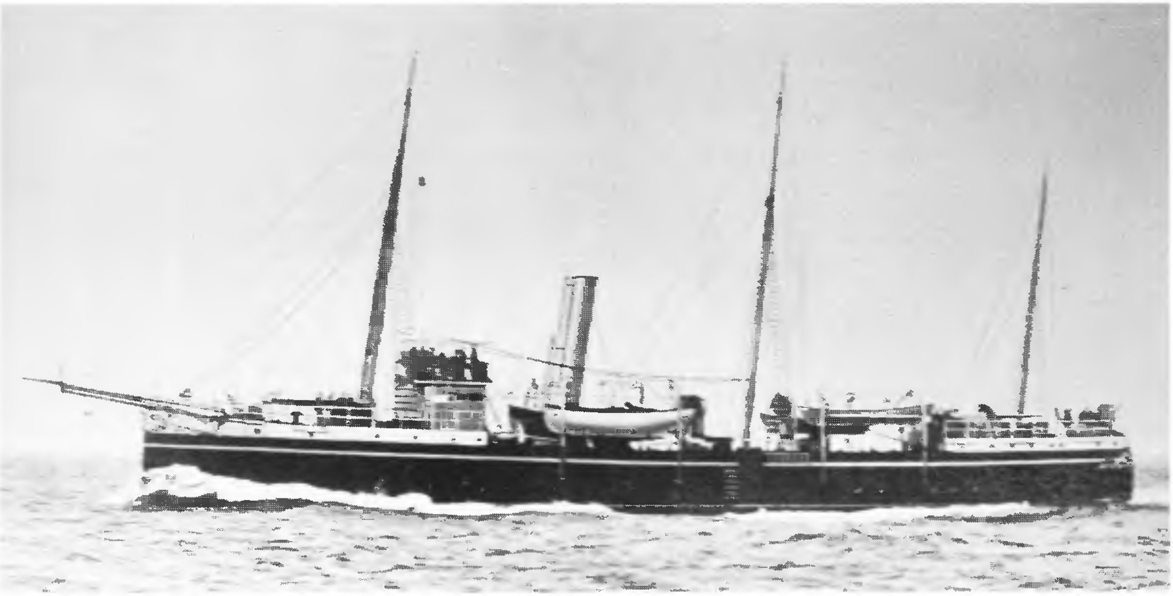


TIRADENTES 1892

General

A smaller version of the REPUBLICA and ordered at the same time as that ship. Both carried three masts but TIRADENTES had only fore and aft rig on all masts. Brazil classified her as a cruiser, but she was really no more than a large gunboat.

Designs were submitted in March 1890 which were accepted in May 1891. During trials the sea was rough and it was felt that 15 knots would have been reached in calmer conditions.



TIRADENTES running trials before acceptance, summer 1892 Photo : Vickers

Career

Left the Tyne for Brazil on 14 November 1892. At the outbreak of the Civil War 1893-94, she was in dock at Montevideo, with a crew described as not very trustworthy. She eventually joined the government squadron but played no active part in the war.

In World War One she was part of the northern division patrolling the Brazilian coast. She was scrapped 5 July 1925.

TRAINING SHIPS

In most of the larger navies, ships were not built specifically for training purposes as that function could be undertaken by obsolescent cruisers, but small navies did order vessels built primarily for training purposes. Once exception was the large sail training ship type, which was found in many major navies, including France, Germany and Italy as well as a number of minor navies.

Armstrongs built a cruiser type for China; certainly it would have been used as a warship if necessary. One sail training ship, the GENERAL BAQUEDANO, was built for Chile; her value as a warship would have been very limited.

GENERAL BAQUEDANO

Chile

Yard & No	Laid down	Launched	Final trials	Designer
Elswick 675	10 May 1897	5 Jul 1898	22 Aug 1899	Phillip Watts

Displacement	2330 tons.
Dimensions	240 (277 oa) x 45 ft 9 in x 18 [73.15 (84.43 oa) x 13.9 x 5.5]
Armament	4 x 4.7 in QF, 2 x 12 pdr QF, 2 x 6 pdr QF, 2 mg. 1 x 18 in TT.
Machinery	1 set 6 cylinder engines by R & W Hawthorn Leslie. Cylinders 2 x 30 in,2 x 50 in, 2 x 81 1/2 in, 48 in stroke. 4 Belleville watertube boilers. Single feathering propeller. Designed IHP 1500 = 12 knots. Trials; six hour full power = 13.7 knots.
Fuel	Coal. 200 tons normal, 347 tons maximum.
Complement	302

General

Armstrongs were invited by the Chilean government in July 1896 to tender for a 2,400 ton "school ship". Their tender and design were accepted and an order placed in March 1897.

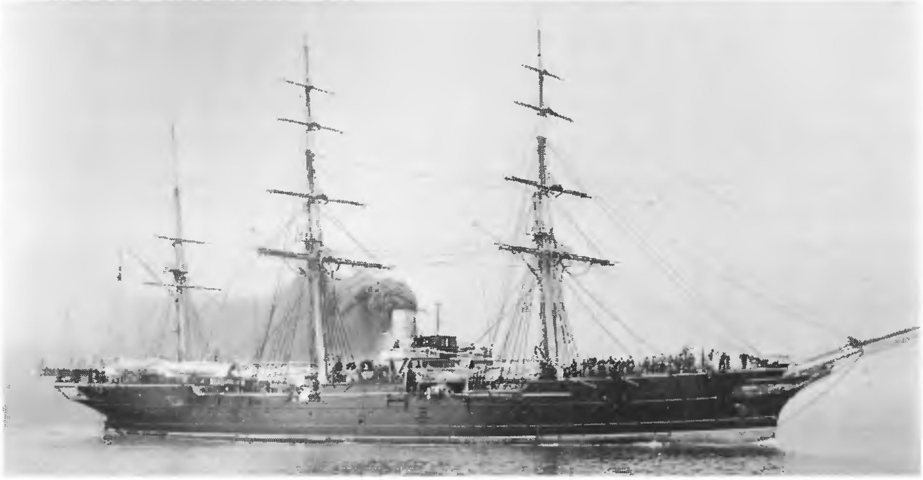
Always referred to in the Yard Report Books as JENERAL BAQUEDANO, her four 4.7 in QF were sponsoned out, two either side of her waist, rigged with a full barque rig in which the foremast was stepped well aft, a large bridge and fixed single funnel. Her single feathering screw was driven by a six cylinder engine, each of the high, intermediate and low pressure cylinders being duplicated. For cruising one of each pair could be uncoupled. The unusual arrangement provided economy of effort at low power, better balancing and reduced the chance of total disablement of the propulsive power by a minor fault in one cylinder.

In her early days she often crossed spare yards on the mizzen to give the impression that she was a full-rigged ship. She received a major refit with new boilers in 1923-24.

Career

Her career was quite unremarkable apart from paying a visit to the islands of Juan Fernandez at the beginning of World War One to enforce the islands' neutrality. Just how meaningless this gesture was became evident when the German cruiser DRESDEN took refuge there in March 1915 and scuttled herself after a brief engagement with HM ships KENT and GLASGOW.

No longer seagoing by the mid 1940's, she was stricken in 1955.



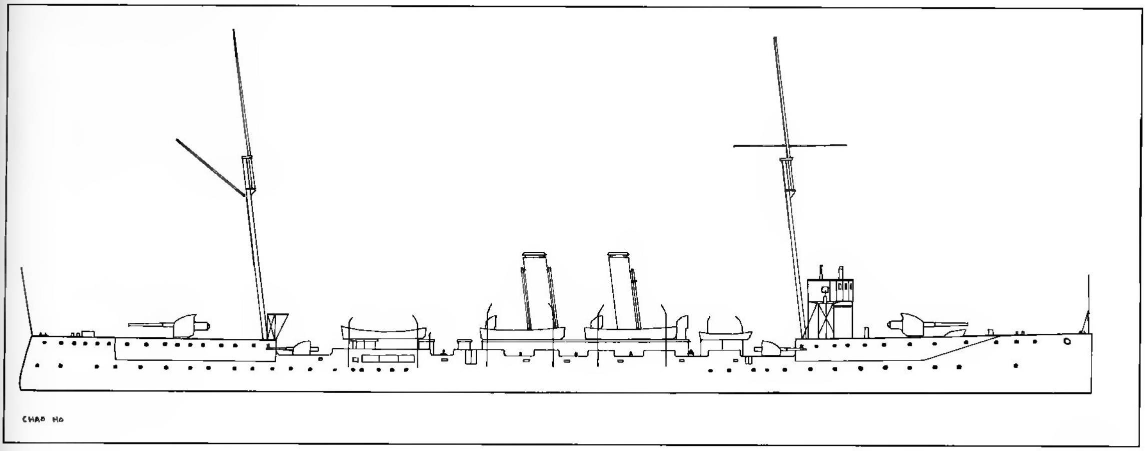
GENERAL BAQUEDANO on delivery, August 1899 Photo : NCL

CHAO HO

China

Yard & No	Laid down	Launched	Final trials	Designer
Elswick 835	7 Nov 1910	23 Oct 1911	21 Feb 1912	J R Perrett

Displacement	2725 tons
Dimensions	330 (346 oa) x 42 x 14 ft 9 in [100.6 (105.46) x 12.8 x 4.5]. Freeboard amidships 9 ft 2 in.
Armament	2 x 6 in 50 cal, 4 x 4 in 50 cal, 2 x 3 in 50 cal QF, 6 x 3 pdr QF, 2 x 37 mm pom-poms. 2 x 18 in TTs above water training broadside.
Armour	Deck 2 in slopes, 1 in flats over machinery and magazines, 1 in aft, ³/₄ in forward. Steering gear 2 in. CT 3 in.
Machinery	3 sets Parsons turbines by R & W Hawthorn Leslie. Boilers 2 Yarrow watertube, 4 single ended cylindrical. Mixed firing. Contract full speed = 20 knots for four hours. Trial 12 hours at 4/5ths power: SHP 5394 = 20.87 kts. 4 hour full power SHP 8622 = 22.125 kts. Measured mile SHP 8797 = 22.257 kts.
Fuel	Oil 100 tons. Coal 150 tons normal, 550 tons maximum.
Complement	330



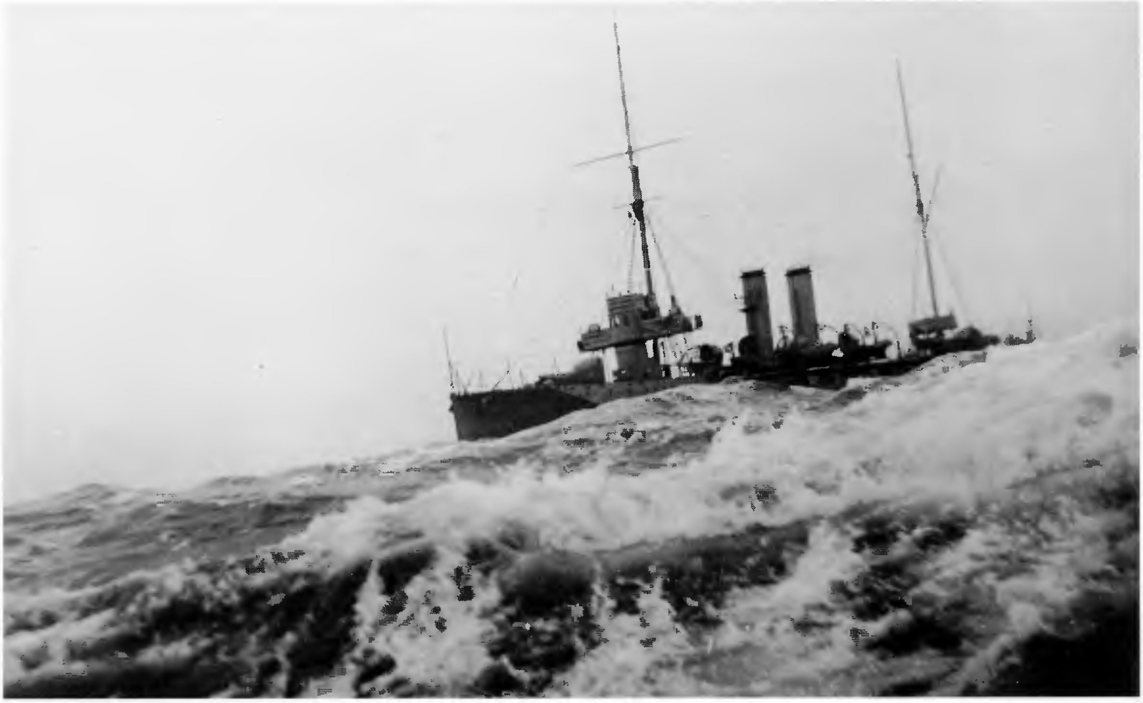
CHAO HO 1912

General

In an effort to improve the efficiency of their fleets, the Chinese government sought tenders in 1910 for training cruisers. The specifications called for ships which were in all essentials small protected cruisers, but with a wide variety of guns and machinery fitted to maximise their training value.

Armstrongs, Vickers and the New York Shipbuilding Co. were successful in tendering, building respectively the CHAO HO, YING SWEI, and FEI HUNG. Armstrongs signed the contract for CHAO HO in August 1910, and the ship was laid down in November. Early progress was slow, owing to a lock-out of boilermakers. Work was kept moving using apprentices until the dispute was settled on 15 December, when it was pushed ahead fast.

Trials were completed in February 1912 after hazy weather had led to the first runs being made close inshore and the expected speed not being achieved. When the weather cleared and runs could be made offshore a speed of 22.25 knots, 2.25 knots over the contract speed was achieved. Perrett had based his hull form on a model developed at the Admiralty tank at Torquay, where he had been employed some years previously, and was proud of the high speed obtained.



CHAO HO at sea in heavy weather, date unknown but not long after first commissioning Photo : NCL

There was a long delay after completion during wrangling with the Chinese over the cost of delivering the ship to the Far East. After the Chinese Revolution in October 1910 the government entered into negotiations to sell two of the ships. FEI HUNG was sold to Greece and became HELLE but both the other two were eventually accepted by China.

Career

CHAO HO was part of the Southern Fleet. When the Japanese invaded China she patrolled the Pearl River and the south coast. On 14 September 1937 she was in action with a cruiser and three destroyers off Kwang-si. She was beached after being damaged by repeated aircraft attacks on 28 September.

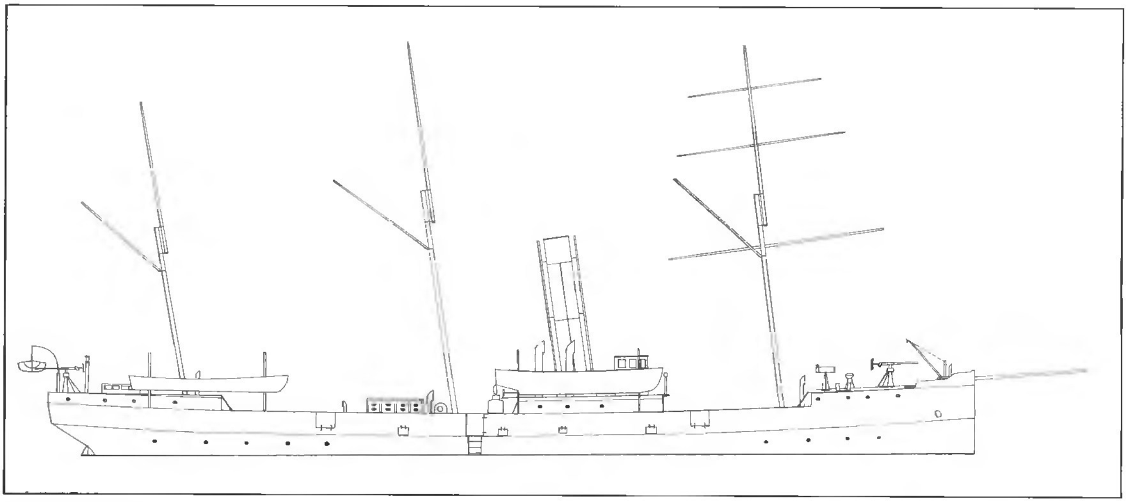
REVENUE CRUISERS

CHUEN TIAO

Imperial Chinese Customs Service

Yard & No	Laid down	Launched	Final trials	Designer
Low Walker 514	May 1887	26 Nov 1887	10 Feb 1888	Phillip Watts

Displacement	716 tons
Dimensions	155 (162 oa) x 15 ft 1 in x 11 ft 6 in [47.24 (49.38 oa) x 7.67 x 3.5]
Armament	2 x 20 pdr BL, 2 mg.
Machinery	2 sets reciprocating engines by Wallsend Slipway & Engineering. IHP 750 = 10 knots.



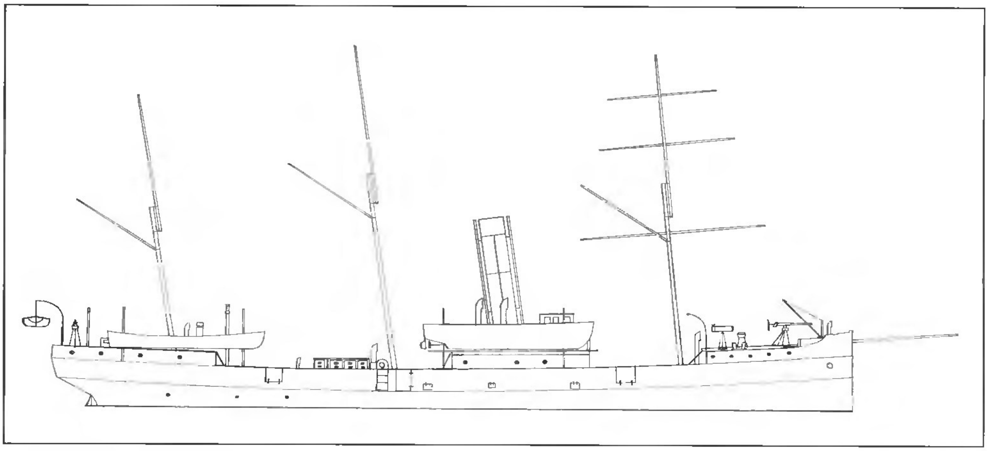
CHUEN TIAO 1888

LI KIN KAI PAN

Imperial Chinese Customs Service

Yard & No	Laid down	Launched	Final trials	Designer
LI KIN				
Low Walker 515	18 May 1887	13 Dec 1887	20 Mar 1888	Phillip Watts
KAI PAN				
Low Walker 516	18 May 1887	17 Dec 1887	20 Mar 1888	Phillip Watts

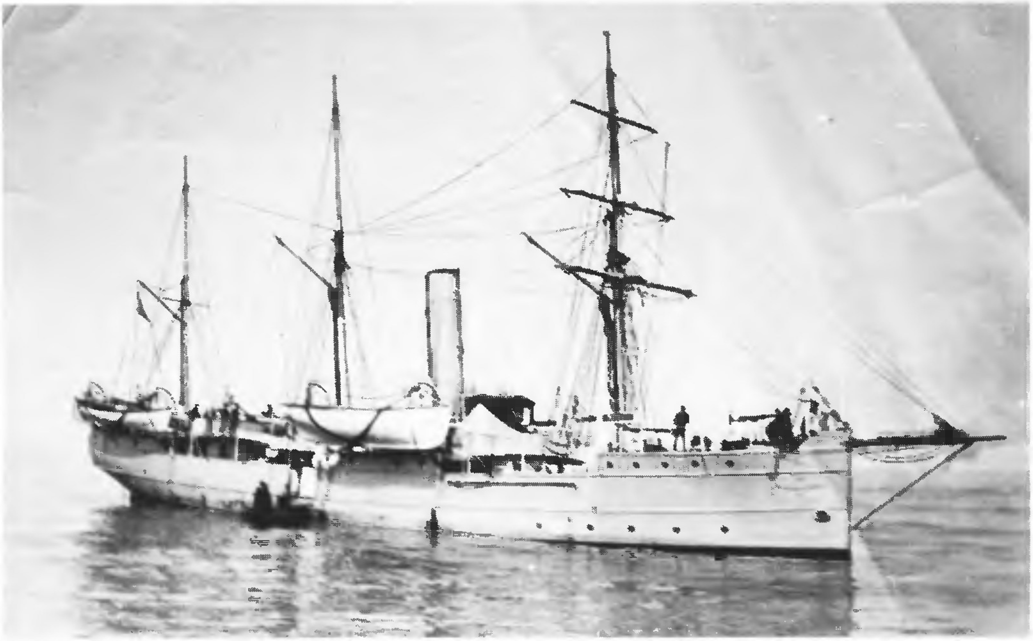
Displacement	512 tons.
Dimensions	135 (142 oa) x 25 ft 1 in x 11 ft 4 in [41.15 (43.28 oa) x 7.64 x 3.5]
Armament	2 x 20 pdr BL, 2 mg.
Machinery	2 sets reciprocating engines by Wallsend Slipway & Engineering. IHP 650 = 10 knots.
Fuel	Coal. 110 tons.



LI KIN and KAI PAN, 1888

General

These three ships were built under J D Campbell's supervision as revenue cutters for the Imperial Chinese Maritime Customs, which operated yet another of China's many independent naval forces, albeit only a comparatively small one. Designed for coastguard work in the Pearl River delta and along the south coast, they were of merchant ship type rather than fully-fledged warships. The CHUEN TIAO was slightly larger than the other two.

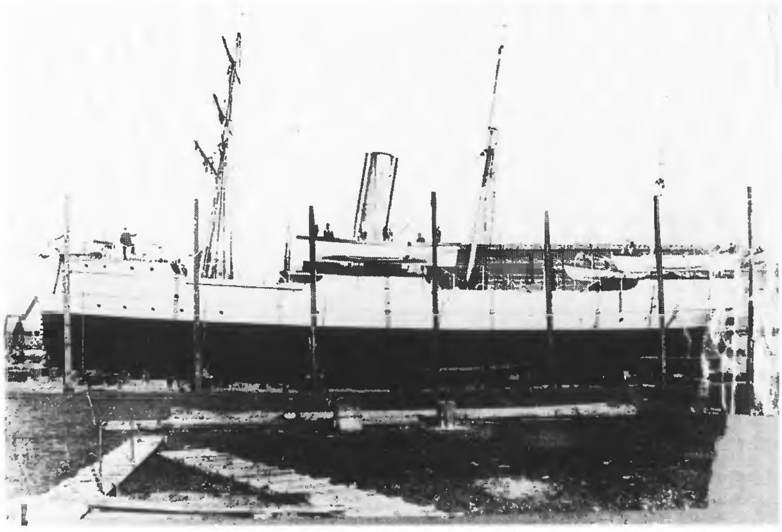


CHUEN TIAO as delivered, c.1888, with barquentine rig. Photo : Vickers

Their 20 pdrs were normally housed on the centre-line fore and aft of the superstructure, but could be traversed to fire on either beam by means of a racer system. Their 10 knot speed was insufficient to overhaul many of the smuggling craft they had to try to apprehend.

Careers

They were built in ten months, and left for China in March 1888. The Board of Trade insisted that they be commissioned as Chinese government ships and fly the Chinese flag for the passage out. Their smart appearance and their work in helping to suppress smuggling and minor piracy added prestige to the Customs Service but they were costly to maintain. CHUEN TIAO and LI KIN are listed in the 1930/31 Lloyds Register as being owned by the Chinese Maritime Customs, Foochow squadron. Their last entry is in the 1933/34 Lloyds Register. KAI PAN is listed as belonging to the Admiralty in the 1920/21 Register: as AIGLO ex KAI PAN belonging to L E Lanier, Port Victoria, Seychelles in the 1925/26 Register. She was wrecked off Diego Suarez in 1926.



One of the two smaller revenue cruisers, completed, but slipped for final examination of underwater fittings before delivery, probably March 1888

Photo : NCM

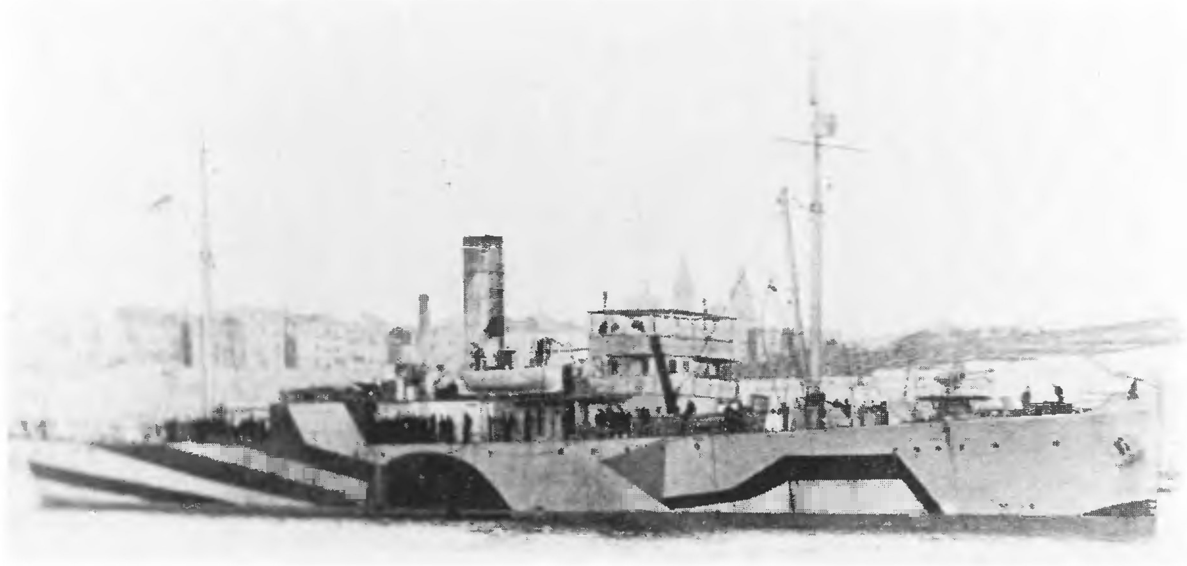
SLOOPS

ANCHUSA BERGAMOT CANDYTUFT CEANOTHUS ARBUTUS AURICULA BRYONY CHRYSANTHEMUM

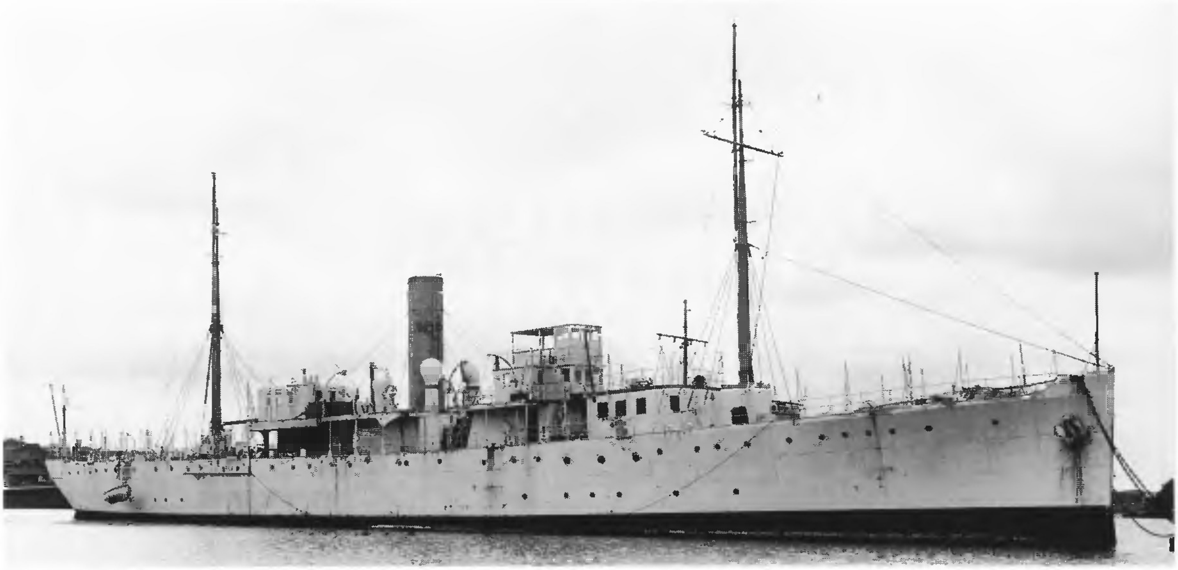
Great Britain

Name	Yard & No	Laid down	Launched	Final trials	Designer
ANCHUSA	High Walker 917	29 Jan 1917	24 Apr 1917	9 Jun 1917	DNC for all
BERGAMOT	High Walker 918	1 Feb 1917	5 May 1917	18 Jul 1917	
CANDYTUFT	High Walker 919	8 Feb 1917	19 May 1917	13 Aug 1917	
CEANOTHUS	High Walker 920	17 Feb 1917	2 Jun 1917	24 Sep 1917	
ARBUTUS	High Walker 926	21 May 1917	8 Sep 1917	31 Oct 1917	
AURICULA	High Walker 927	21 May 1917	4 Oct 1917	1 Dec 1917	
BRYONY	High Walker 928	9 Jul 1917	29 Oct 1917	22 Dec 1917	
CHRYSANTHEMUM	High Walker 929	9 Jul 1917	10 Nov 1917	2 Feb 1918	

Displacement 1291 ½ tons.
Dimensions 255 ft 3 in (276 ft 6 in oa) x 35 ft 1 in x 11 [78.8 (84.30 oa) x 10.7 x 3.4]
Armament ANCHUSA 2 x 4 in BL, 1 x 2 pdr.
BERGAMOT 2 x 4 in BL, 2 x 12 pdrs, 1 mg.
CANDYTUFT 2 x 4 in BL, 2 x 12 pdrs, 1 mg. 2 x 18 in TT
CEANOTHUS 2 x 4 in BL, 1 x 12 pdr, 1 x 2½pdr, 1 mg. 2 x 18 in TT.
ARBUTUS 2 x 4 in BL, 1 x 2 pdr on tilting mounting, 1 x 13.5 in bomb howitzer, 1 x 2½ pdr, 1mg
AURICULA 2 x 4 in BL, 2 x 12 pdrs, 1 x 200 lb stick bomb howitzer.
BRYONY 2 x 4 in BL, 2 x 12 pdrs, 1 x 2½ pdr, 1 mg, 2 x 18 in TT.
CHRYSANTHEMUM 2 x 4 in BL, 1 x 12 pdr on tilting mounting, 1 x 2½ pdr, 1 mg. 2 x 18 in TT. 1 x 200 lb stick bomb howitzer, 4 depth charge throwers.
Machinery Single set triple expansion by Wallsend Slipway & Engineering Co. 2 cylindrical boilers. IHP 2500-2700 = 17-17.5 knots.
Fuel Coal. 560 tons
Complement 92



CEANOTHUS at Malta late in 1917 or early in 1918, in dazzle paint Photo : Author's collection



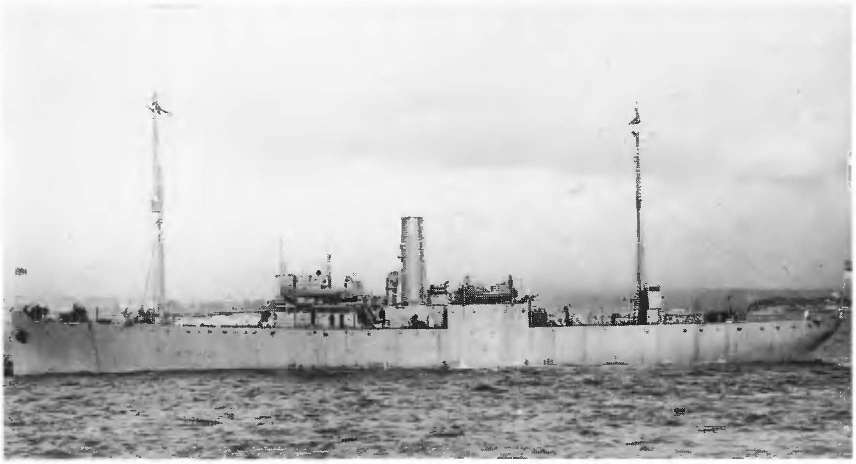
BRYONY in 1937, laid up awaiting sale and scrapping Photo : NMM N4093

General

These eight belonged to the ANCHUSA group of the Flower class of sloops, of which a total of 112 were built between 1915 and 1918. The first Flowers were built for minesweeping and anti-submarine duties, and had two funnels and a warship appearance. The later AUBRETIA and ANCHUSA groups were deliberately designed to look like merchant ships, and were designated Convoy Sloops or, in some ships where the armament was concealed, as "Q" Ships. Details of appearance were deliberately varied. All the Flower class were designed to be built in merchant shipyards, and not to require specialist warship builders.

Careers

ANCHUSA torpedoed 16 July 1918 by U54 off the north coast of Ireland. BERGAMOT torpedoed 13 August 1917 by U84 in the Atlantic. CANDYTUFT torpedoed 18 November 1917 by U39 off Bougie. ARBUTUS torpedoed 16 December 1917 by UB65 in St Georges Channel. CEANOTHUS sold to the RIM and renamed ELPHINSTONE; wrecked 24 January 1925 Nicobar Islands. AURICULA sold 1 February 1923 to G Hornby. BRYONY arrived Cashmores, Newport 3 April 1938 for scrapping. CHRYSANTHEMUM became one of the London Division RNVR .drill ships until the late 1980's, when she was sold to the Chrysanthemum Trust. Scrapped in 1995-96 at



CHRYSANTHEMUM in Plymouth Sound in 1920 Photo : NMM P39765

Appendix

GUNS AND MOUNTINGS

Muzzle Loading Rifled Guns (MLR)

The original Armstrong breech loading system was found in practice to be unsatisfactory; breech blocks were often not screwed up completely, resulting in their being blown out, while the larger calibre guns required excessively heavy blocks. For these reasons Great Britain reverted to muzzle loading in the early 1860s. The early Armstrong guns, both BL and MLR, were made up of an inner steel tube reinforced by wrought iron coils shrunk over each other; this composite construction was favoured over all steel because of the poor quality at that time of that material. All of the guns mounted on gunboats, including the "alphabeticals", were built upon this principle. Carriages were of iron, and recoil and running out were accomplished by hydraulic power.

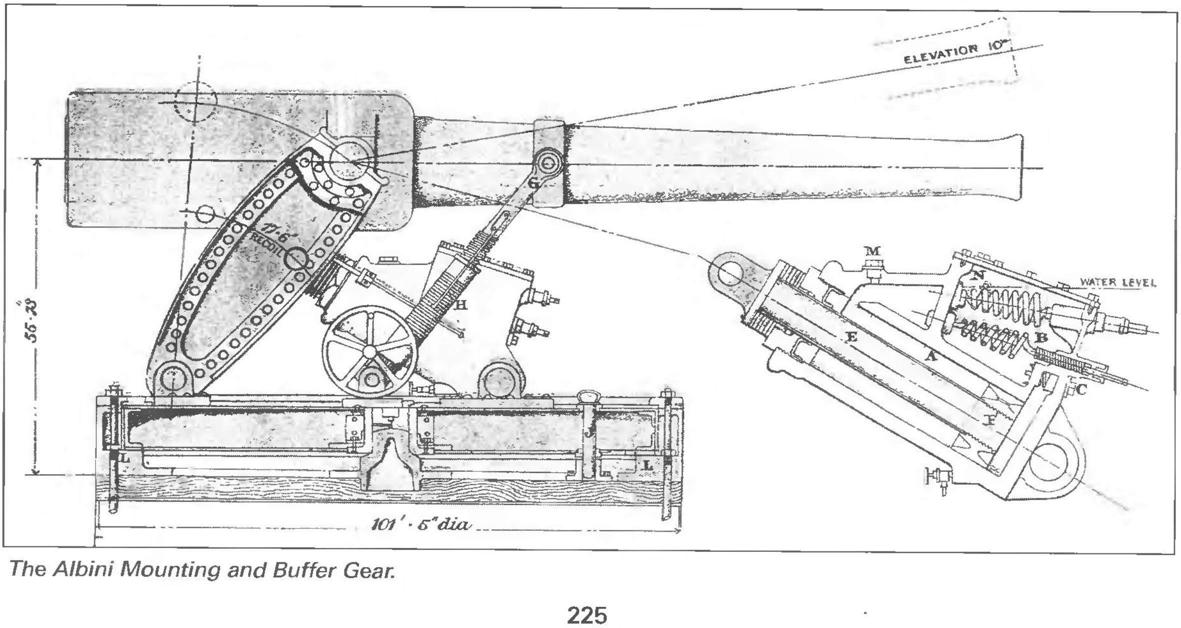
Breech Loading Guns (BL)

The introduction of slow burning, large grain powder in the late 1870s made it necessary to have longer barrels and this in turn forced the reintroduction of breech loading using an interrupted screw for closing the breech block. Initially the guns (including the TSUKUSHI class 10 in) were of iron and steel construction, but from the early 1880s improved steel manufacture enabled Armstrongs to make all steel guns; ESMERALDA's armament was probably of all steel manufacture. The charges were usually made up in silk bags. Loading was slow, partly because of the design of the breech block which first had to be rotated, then pulled out of the breech and finally swung to one side, and partly because the chamber had to be sponged out before reloading, in case any grains of burning powder had been left behind. From about 1890 a layer of wire wound under tension was used in gun manufacture. This provided great radial strength but contributed nothing to longitudinal strength, so that long heavy guns tended to droop at the muzzle.

A few 4.7 in and 6 in guns were on Albini mountings, which used a hydraulic buffer to control recoil, and gravity to return the gun to the firing position; this mounting proved unsatisfactory and Armstrong medium calibre guns were all on Vavasseur centre pivot (VCP) mountings, where recoil was checked by two hydraulic cylinders, with the guns returning to the firing positions by running down an inclined carriage. From the early 1890's the VCP was replaced by the "rocking cradle" carriage originally designed for QF guns.

Quick Firing Guns (QF)

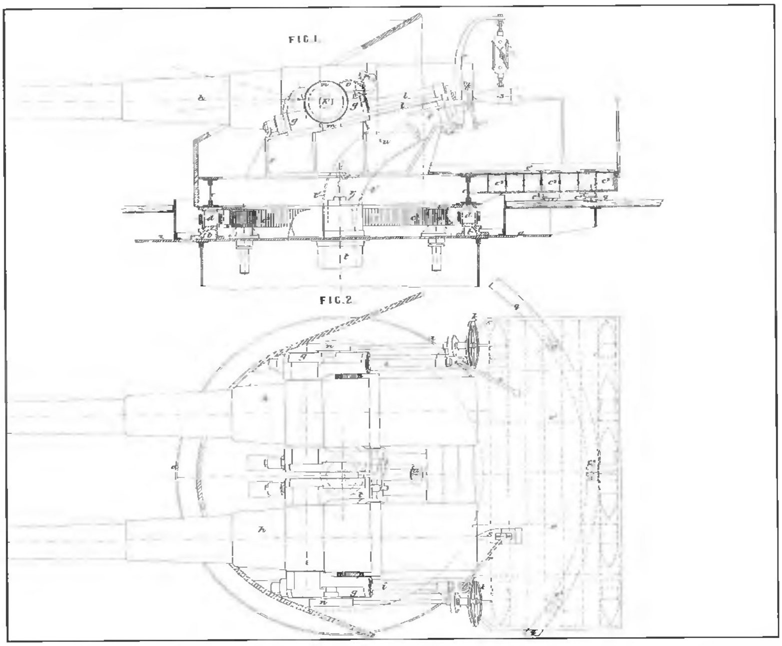
To provide a defence against torpedo boats, quick-firing guns firing three or six pound projectiles were introduced in exclusively. Both types featured brass cartridge cases and vertical wedge breech blocks. In 1886 Armstrong introduced the 4.7 in QF, initially with a 36 pdr projectile attached to the cartridge case, the so called simultaneous loading system, but shortly after, a 45 pdr projectile separate from the cartridge case became standard. Because of the brass case no sponging out was required, while breech opening and closing was speeded up by the coned breech screw, and further facilitated by a single motion breech lever which replaced the original three-motion type



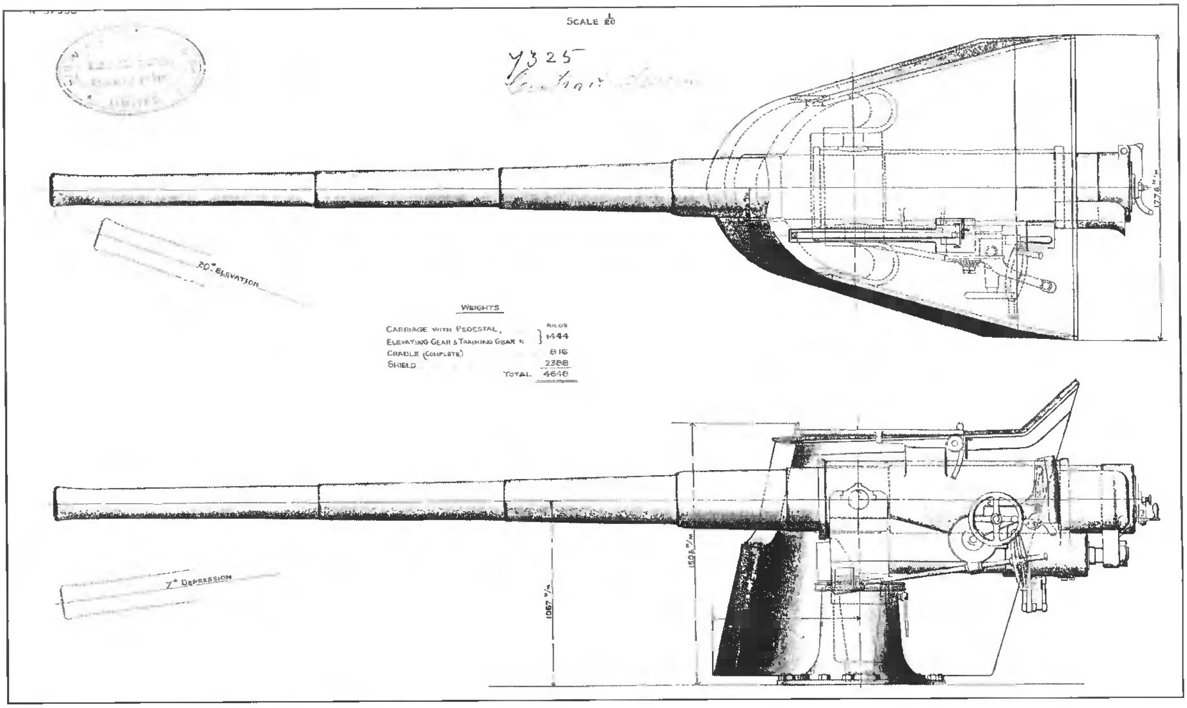
The Albini Mounting and Buffer Gear.

in about 1890. The final development of the QF gun was its being mounted in a non-recoil cradle which carried the sights; the gun was returned to the firing position by springs. This arrangement meant that the gun recoiled in the line of fire while the layer and trainer could keep their eyes on the sights the whole time.

By the beginning of this century the introduction of the Welin type breech block and the non-recoil cradle resulted in BL guns having a rate of fire comparable to the QF type. The reversion to bagged charges instead of cartridges for most guns of 4 in calibre and over was necessitated by the need for the shaped chamber of varying diameter resulting from higher ballistics; metallic cartridges under these conditions would have had to have been excessively long. Another factor was weight saving, as medium calibre brass cases were heavy, the 4.7 in weighing 9 lb 6 oz and the 6 in, 21 lb 6 oz.

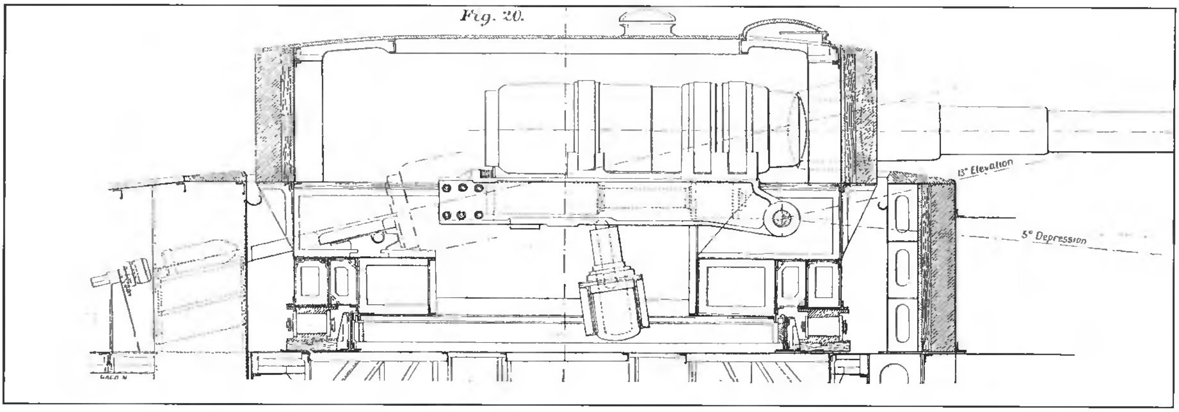


Twin 8 in mounting as fitted in the Chinese protected cruisers CHIH YUAN and CHING YUAN



Upper Deck Pedestal Mounting for 4.7 in 50 cal QF gun

Fig. 20.



Turret and mounting for VICTORIA's 16.25 in guns

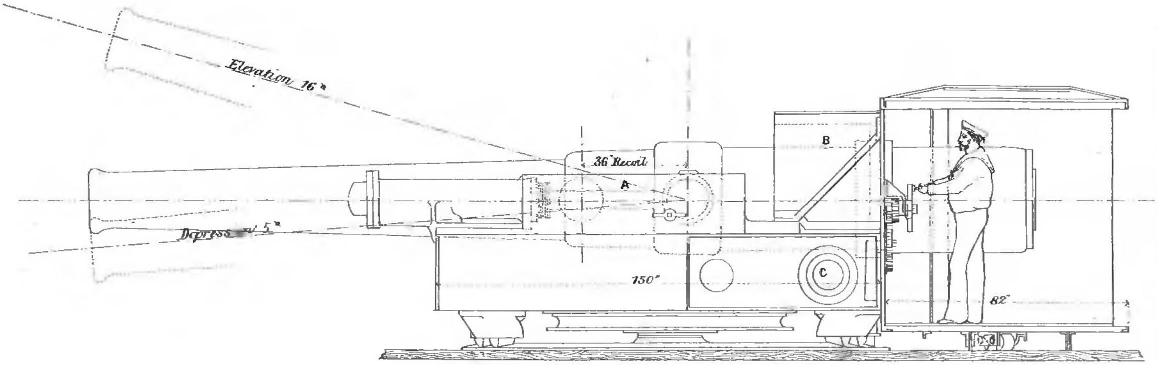
Table App1/1
ARMSTRONG GUNS

MUZZLE LOADERS

Gun	Diameter of bore (inches)	Length of bore (Calibres)	Weight of gun	Weight of projectile (lbs)	Nature of charge	Weight of charge (lbs)	Muzzle velocity (ft/sec)	Muzzle energy (ft/ton)	Ships on which mounted
	9	3.9	12 ½ tons	256	Pebble	50	1440	3680	STAUNCH EVER
	11	13	26 ½ tons	533	Pebble	85	1400	7203	ALPHA
	11	23	35 tons	536	Pebble	235	1810	12,200	EPSILON
	12 ½	16	38 tons	800	Pebble	130	1352	10,365	GAMMA

SCALE $\frac{1}{40}$

FIG. 9.

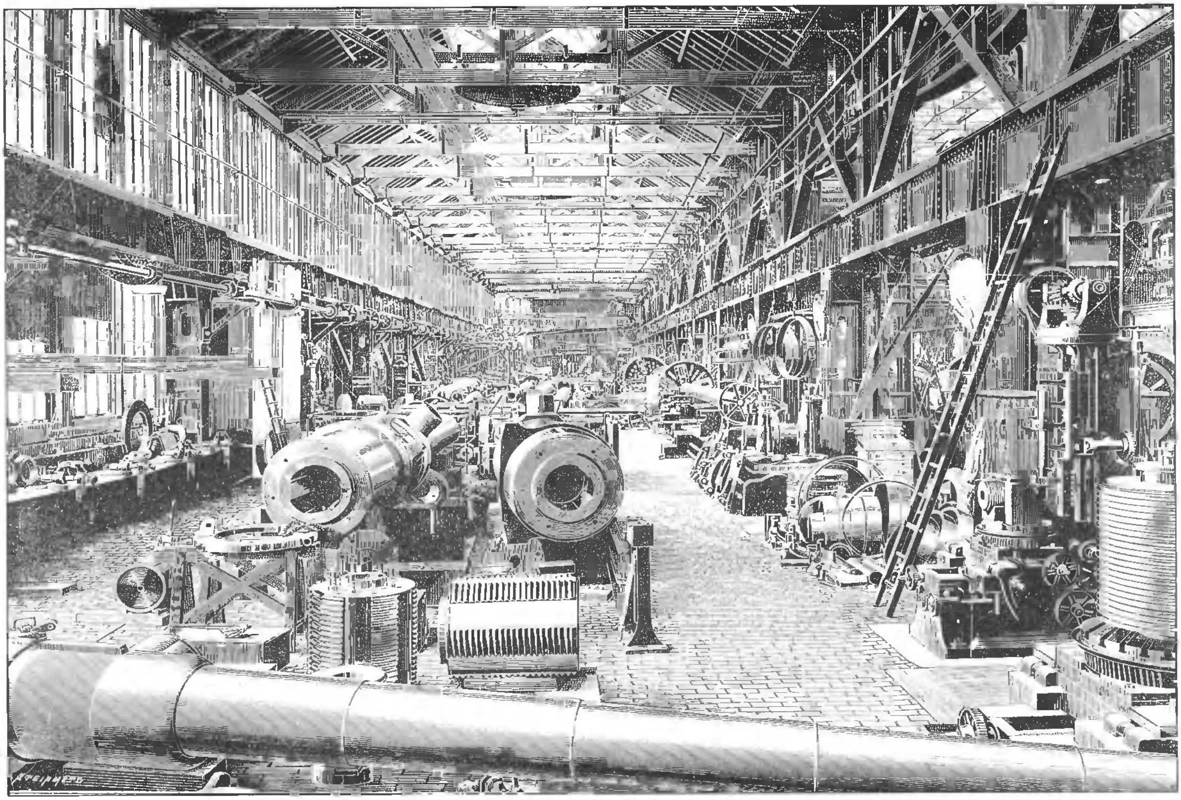


HYDRAULIC CENTRE PIVOT MOUNTING, FITTED WITH VAVASSEUR RECOIL PRESSES FOR 10 INCH B. L. GUNS.

SCALE $\frac{1}{50}$

Centre Pivot Hydraulic Mounting for 10 in BL gun as fitted in NANIWA, TAKACHIHO, and VICTORIA.

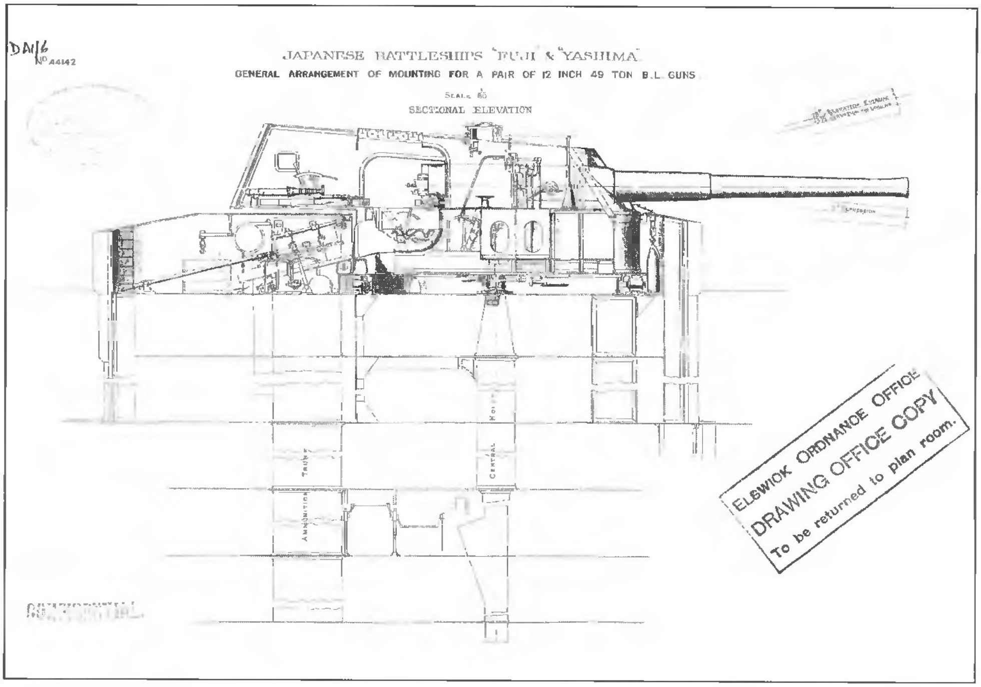
from Trans INA



The Heavy Gun Shop at Elswick, 1889, with the breech blocks for VICTORIA's 110 ton guns in the foreground.
Engraving from Engineering 18.

BREECH LOADERS

Gun	Diameter of bore (inches)	Length of bore (Calibres)	Weight of gun	Weight of projectile (lbs)	Nature of charge	Weight of charge (lbs)	Muzzle velocity (ft/sec)	Muzzle energy (ft/ton)	Ships on which mounted
9pdr	2.6	29	5 cwt	9	Pebble	2¼	1550	150	TSUKUSHI etc
12pdr	3	28		13	Pebble	3½	1600		EPSILON
20pdr Cruisers	3.8	16		21	Pebble	5	1400		Chinese Revenue
Mk X	4	45	2.125 tons	31	Cordite	7.69 MD 7.914 SC	2642		GORGON
12cm	4.7	22	1.32 tons	40	Pebble	10	1575	688	TSUKUSHI etc
Patt CC	4.7	50	3.316 tons	45	Cordite	15.1	3000		MINAS GERAES
	5.9	26.6	4.15 tons	82	Pebble	34	1946		BAUSAN
Patt FF	5.9	46	7 tons	99.3	Cordite	21.5	2625		NORGE
Patt D (Mk I)	6	26.3	4.065 tons	80	Pebble	34	1880		Australian Gunboats
Patt I	6	30	4 tons	80	Pebble Cordite	40 21.5	2090 2290	2500 2884	ESMERALDA


DAI/6
No 44142
JAPANESE BATTLESHIPS "FUJI" & "YASHIMA"
GENERAL ARRANGEMENT OF MOUNTING FOR A PAIR OF 12 INCH 49 TON B.L. GUNS
SCALE 1/80
SECTIONAL ELEVATION
AMMUNITION TRUNK
CENTRAL HOIST
ELSWICK ORDNANCE OFFICE
DRAWING OFFICE COPY
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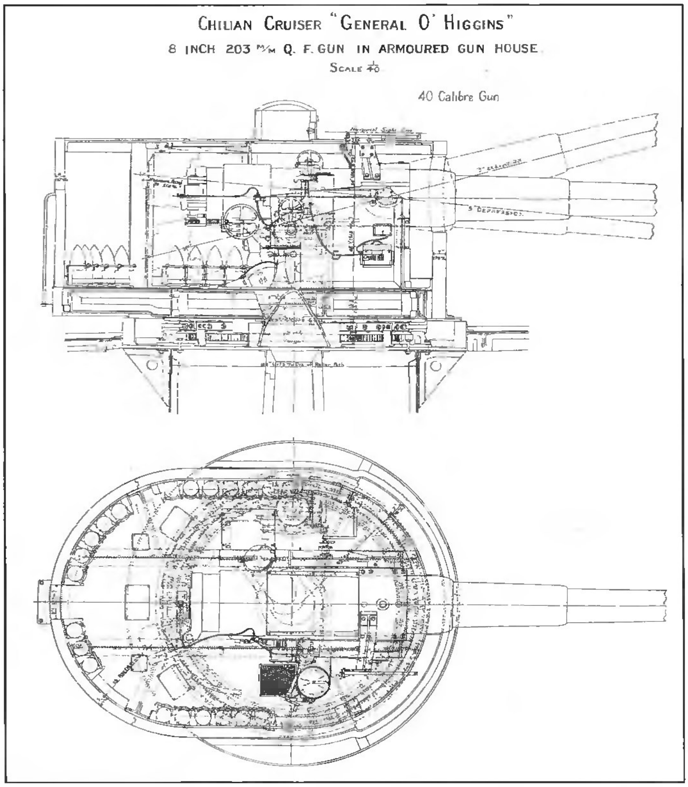
Pear-shaped barbette with armoured hood for a pair of 12 in BL guns as fitted on board YASHIMA and FUJI

Gun	Diameter of bore (inches)	Length of bore (Calibres)	Weight of gun	Weight of projectile (lbs)	Nature of charge	Weight of charge (lbs)	Muzzle velocity (ft/sec)	Muzzle energy (ft/ton)	Ships on which mounted
Patt M	6	32	2 tons	100	Pebble	50	1960	2664	DOGALI
Mk XIII	6	50	8.777 tons	100	Cordite MD	24.63	2770		AGINCOURT
Patt TT Mk XVII	6	50	8.144 tons	100	Cordite MD	32.31	3000		CANADA
Mk XVIII	6	48.92	8.733 tons	100	Cordite MD	28.63	2874		GLATTON
Mk XXII	6	50	9.0125 tons	100	Cordite SC	31	2960		NELSON
Patt A Mk III	7.5	50	15.75 tons	200	Cordite	54.25	2781		SWIFTSURE
Patt G	8	26	11.5 tons	180	Pebble	90	2030	5143	PROTECTOR
Patt P	8	40	15.5.tons	210	Cordite	32	2442	7319	BLANCO ENCALADA
				250	Cordite	32	2008	7413	
				210	Cordite	44	2570	9618	
				250	Cordite	44	2369	9729	
Patt T	8	40	16.54 tons	210	Cordite	47	2575		O'HIGGINS
				250	Cordite	47	2440		
	8	40	19.5 tons	210	Cordite	48	2660		BUENOS AIRES
				250	Cordite	48	2500		

Patt S	8	45	19.5 tons	210 250	Cordite Cordite	55 55	2817 2582	11555 11557	TAKASAGO & Armoured Cruisers
Patt B, C	8.24	45	18.5 tons	313	Cordite	47	2297		TORDENSKJOLD, NORGE
Mk XII	9.2	51.35	31.2 tons	380 391	Cordite Cordite	128Ω 152	2940 3060		GLATTON
24 cm	9.449	50	30.5 tons	418.75	Cordite	144	2900		BJOERGVIN
	10	25	25 tons	450	Pebble	180	1900		TSUKUSHI
Patt F	10	30	24 tons	450 450	Pebble Cordite	230 85	2060 2050	13,241 11,302	ESMERALDA
Patt S	10	45	39.4 tons	500	Cordite	146.8	2656		SWIFTSURE
Patt G	12	40	49 tons	850	Cordite	155	2400		YASHIMA
	12	45	58 tons	850	Cordite	255	2700		KASHIMA
	12	45	61 tons	850	Cordite	285	2800		MINAS GERAES
Mk XIII	12	45	60.7 tons	850	Cordite	285	2725		AGINCOURT
Mk I	14	45	84.75 tons	1586	Cordite MD	344	2475		CANADA


Chilian Cruiser "General O' Higgins"
8 inch 203 m/m Q. F. Gun in Armoured Gun House
Scale 1/40
40 Calibre Gun
5° Depression

Armoured gunhouse with a single 8 in QF gun as fitted in O'HIGGINS

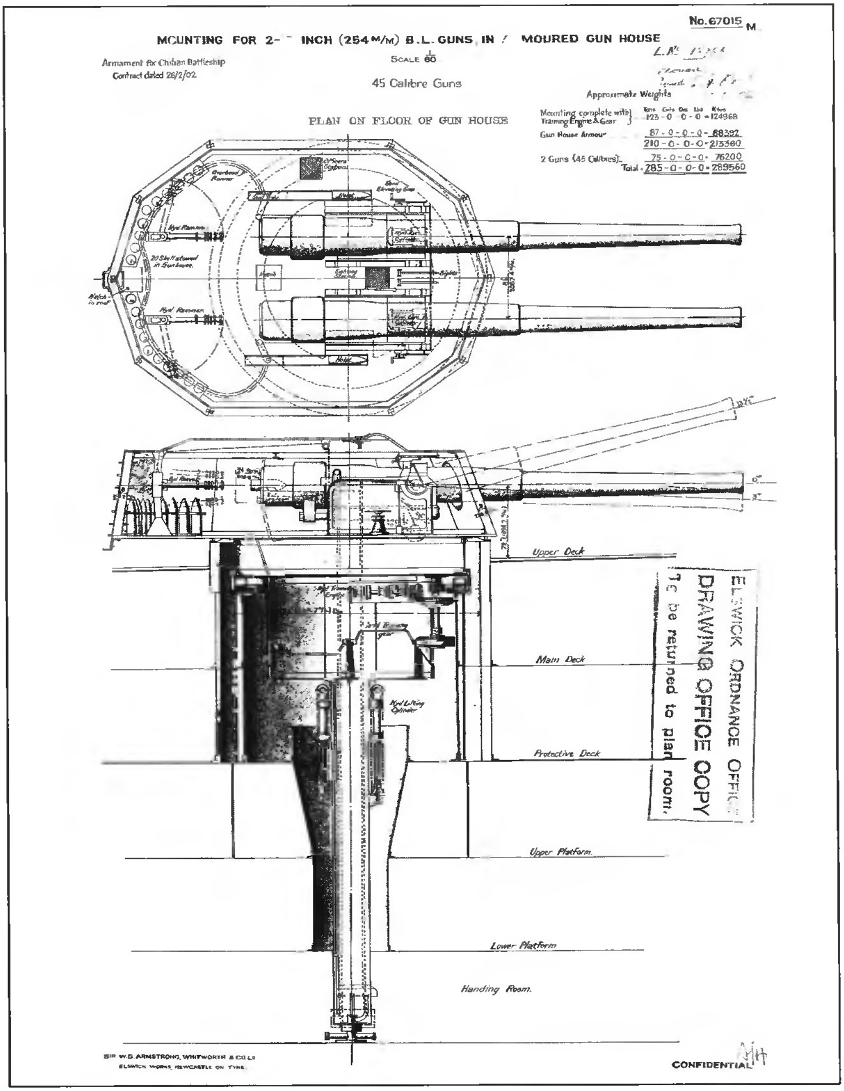
Gun	Diameter of bore (inches)	Length of bore (Calibres)	Weight of gun	Weight of projectile (lbs)	Nature of charge	Weight of charge (lbs)	Muzzle velocity (ft/sec)	Muzzle energy (ft/ton)	Ships on which mounted
Mk I	15	42	100 tons	1920	Cordite MD	428	2467		
				1938	Cordite SC	432	2458		MALAYA
				1938	Cordite SC	486	2638		
Mk I	16	45	106 tons	2048	Cordite MD	498	2586		NELSON
Mk I	16.25	30	111 tons	1800	Slow burning cocoa	960	2087		VICTORIA

QUICK FIRERS

Hotchkiss 37 mm	1.46	20	73lbs	1.1	RS	2.8oz	1319	13.3	
		25	79lbs	1.1	Cordite	1.13oz	1450	14.4	
		45	288 lbs	1.1	C2	4.5oz	2302	55	
Hotchkiss 47 mm	1.85	40	506lbs	3.3	Cordite	7.4oz	2150	105.8	
Hotchkiss	2.24	40	800lbs	6	C2	2	1820	137.8	
		50	10cwt	6	Cordite	1.3	2592	279.5	
	3.5	40	24cwt	20	Pebble	7.75	1950	572.3	SAMPAIO
					Cordite	3.75	2420	812.2	
	3.75	40	33cwt	25	Pebble	10	2010	700.4	FEI TING
					Cordite	4.5	2370	974	
	4.7	35	34cwt	30	Pebble	9.5	1907	813	1st Prototype
Patt M	4.7		34cwt	36	Pebble	12	2060		2nd Prototype
	4.7	40	42cwt	45	Smokeless EXE	9.5	1910	1442	PIEMONTE
					Cordite	5.5	2150		
Patt Y	4.7	45	53cwt	45	Cordite	8.4	2570	2061	BUENOS AIRES
	4.7	50	55cwt	45	Cordite	8.41	2630	2158	ALBANY
15 cm	5.87	50 1	8 tons	99.2	Cordite 13 cwt	32.5	2900	5773	BJOERGVIN
	6	40	5.75 tons	100	Smokeless EXE	34	1975	2705	PIEMONTE
					Cordite	15	2220	3417	9 de JULIO

Gun	Diameter of bore (inches)	Length of bore (Calibres)	Weight of gun	Weight of projectile (lbs)	Nature of charge	Weight of charge (lbs)	Muzzle velocity (ft/sec)	Muzzle energy (ft/ton)	Ships on which mounted
Patt Z	6	40	6.6 tons	100	Cordite	18.3	2500	4337	O'HIGGINS
	6	45	8.1 tons	100	Cordite	24	2600	4687	BUENOS AIRES
	6	50	7.6 tons	100	Cordite	19.5	2642	4840	ALBANY

Sources : Elswick Ordnance Plans and Tables, NMM;
Lloyd and Hadcock. Table opp p153;
NID Handbook on War Vessels and Torpedo Boats.China. Italy;
Wright and Fisher p362; Campbell. Super-Heavy Guns. British Naval Guns.
Naval Weapons of World War Two;
Specification of Armament for a Coast Defence Ship for the Royal Norwegian Government, Elswick Works May 1913;
Ordnance Tables in Brasseys Naval Annuals, various dates.


No.67015 M
MOUNTING FOR 2- INCH (254 M/M) B.L. GUNS IN ARMOURED GUN HOUSE
Armament for Chilian Battleship
Contract dated 26/2/02
SCALE 1/60
45 Calibre Guns
PLAN ON FLOOR OF GUN HOUSE
Approximate Weights
Tons Cwts Qrs Lbs Kilos
Mounting complete with Training Engine & Gear 123 - 0 - 0 - 0 = 124968
Gun House Armour 87 - 0 - 0 - 0 = 88392
210 - 0 - 0 - 0 = 213360
2 Guns (45 Calibres) 75 - 0 - 0 - 0 = 76200
Total 285 - 0 - 0 - 0 = 289560
Overhead Rammer
Hyd. Rammer
20 Shell stowed in Gunhouse
Hatch
Upper Deck
Main Deck
Protective Deck
Upper Platform
Lower Platform
Handing Room
Hyd. Lifting Cylinder
ELSWICK ORDNANCE OFFICE
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SIR W.G. ARMSTRONG, WHITWORTH & CO. LD
ELSWICK WORKS, NEWCASTLE ON TYNE
CONFIDENTIAL

Mountings and armoured gunhouse for 2 x 10 in BL guns as fitted in SWIFTSURE

BIBLIOGRAPHY

Primary Sources

(1) archival material

Armstrong archival material is mainly in three locations:

1 Cambridge University Library (CUL)

a. The main sources are the two Elswick Yard Report Books (Vickers 1157 & 1158). Volume 1 runs from January 25th 1883 - May 26th 1897 and Volume 2 from July 22nd 1897 - January 14th 1913. (Volume 3 is missing.) These are written in very legible copper plate hand writing and each report, which was made for the directors meeting, is signed by the chief naval architect. Initially the reports are entirely about the yard formation but from 1884 details of ships under construction or repair and notes on designs and tenders prepared in response to enquiries begin to appear.

b. One volume. Vessels etc. Built at the Naval Construction Works. Barrow in Furness.. Brief details of warships built pp 31 - 66. (Vickers 104)

c. Three typewritten pages giving details of the proposed agreement with handwriting annotation, in places barely legible, possibly by Lord Rendel (Vickers 551).

d. One ships cost book No 3 commencing with the HATSUSE in 1897 and ending with the AFRIDI in 1909. The next entry after AFRIDI is the RIO DE JANEIRO but the pages are blank for this ship.

e. Photographs and photograph albums of a number of Armstrong built ships. (All the above material is reproduced by permission from the Vickers Archives held at the Cambridge University Library).

2. Tyne & Wear Archive Services (TWAS)

This contains five directors books covering the period 1882 to 1916. (TWAS 31/1264 - 1268) Much of the detail about warships is a summary of that in the Yard Report Books but there is some interesting policy matter, eg, the interest shown by various countries in 482 (DOGALI) and the question of supplying side armour to VEINTICINCO DE MAYO. Volume 5 partly fills the gap caused by the missing yard report book 3 but details of ships cease from July 1915 with the recurrent note "reports having been circulated and discussed" relating to the shipyards and other parts of the works.

The other important source comprises the papers of Lord Rendel. TWAS 31/5110, 5120 - 5123, 5130, 5064 - 5056, 5080, 5073. The most germane section is the correspondence, mostly with J D Campbell, about Chinese gun vessels and cruisers, the plans for the GAMMA class, and the CH'AO YUNG. Access to the Rendel archive was kindly granted by Miss Rosemary Rendel.

3. National Maritime Museum (NMM)

a) **Thurston Papers**: George Owens (later Sir George Thurston) worked at Armstrong's in the 1890's and subsequently became Vickers chief naval architect. The two green notebooks contain details of dimensions, IHP, speed, armament and breakdowns of weights of ships

b) **D'Eyncourt Papers:** There is some material relating to his time at Armstrong's, most importantly the negotiations with Brazil relating to the RIO DE JANEIRO.

c} A number of bound volumes on foreign navies, covering the 1890's, produced by the Admiralty Intelligence Department.

d) **Particulars Book 1:** This contains several sections.

(i) Particulars of ships built giving dimensions, displacements, IHP, speed, coal, armament, armour, protection and sometimes complement as well. The data is sometimes inaccurate, eg, TSUKUSHI's, ESMERALDA's and NANIWA's forced draught speeds are given as being attained with normal draught; while with MINISTRO ZENTENO and her sister ships, freeboard forward is given almost the same as that amidships. Does not cover DRUDGE, NELSON or any submarines.
(ii) An incomplete list of dates of keel laying, launching and official trials.
(iii) A summary of armament and ammunition carried but with no details as to the guns apart from calibre.

(iv) Principal scantlings on a dozen or so ships with details for a few Royal Navy vessels.
(v) Particulars of machinery including weights, length of engine and boiler rooms, dimensions of screws, speed and IHP; data not always complete.
(vi) Boiler weights and sketches of boiler engines for a number of ships from the mid 1890's onwards.
(vii) Launching particulars giving details about length, declivities, weights etc.

e) **Individual Ships Particular Books**
These begin with YASHIMA, and include HATSUSE, KASHIMA, CONSTITUCION, MINAS GERAES, RIO DE JANEIRO and ALMIRANTE LATORRE; other vessels are the armoured cruisers O'HIGGINS, ASAMA, TOKIWA, IDZUMO and IWATE; training cruiser CHAO HO; coast defence ships NORGE, EIDSVOLD, GLATTON and GORGON; scouts ADVENTURE and ATTENTIVE, BAHIA and RIO GRANDE DO SUL; cruisers AMETHYST and ABDUL HAMID; river gunboats ROSARIO, PARANA, RATANOKOSINDRA (both designs); Admiralty designed submarines. The books for all armoured cruisers and the NORGE and EIDSVOLD contain preliminary designs with alternatives; all contain much more detail than the single volume particulars book.

f) **Armament Folders From The Drawing Office Of The Elswick Ordnance Office**
These include tables of guns and designs of guns and mountings, often with details about weights, muzzle velocity and energy. Unfortunately few are dated, or can be identified as being made for particular ships, but it is possible to identify a few often where they were used to illustrate Lord Armstrong's 1899 paper given to the INA.

g) **Design Portfolio No 3**
Armstrong Whitworth 1910-1914. This contains a large number of drawings of proposed battleships together with typewritten specifications for these and smaller vessels.

h) **Ships Covers**
  (i) HMS MERSEY which contained some information on Esmeralda and opinions of officers on her design and performance.
  (ii) MEDEA class.

4 J S White Archive. Cowes Maritime Museum

Details of SEA SERPENT (later FEI TING) as first built

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(2) printed material

(including Official Publications)

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    Foreign non-European Unarmoured vessels. March 1887 No 206;
    Warships and Torpedo Vessels. Central and South American Republics 1891 No 251;
    China Oct 1891 No 270; Italy 1892 No 319; Central and South American Republics 1897 No 468;
    Japan War Vessels etc 1898; United States 1899 No 541; All held at the Admiralty Library
ARMSTRONGS: Simultaneous loading guns and their mountings constructed by Sir W G Armstrong, Mitchell & Co Ltd. NMM
CORBETT JS, Maritime Operations in the Russo-Japanese War 1904 - 5. 2 Vols 1995 reprint
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ELSWICK WORKS Report of firing trials. Privately printed. Newcastle Upon Tyne 1894
FAIRBAIRN A R Elswick (np) MS in Vickers Archive, 593. C U L
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